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ADAPTATION IN PATHOLOGICAL PROCESSES.[1]

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Grateful as I am for the personal good-will manifested by my selection as President of this Congress, I interpret this great and unexpected honor as an expression of your desire to give conspicuous recognition to those branches of medical science not directly concerned with professional practice, and as such I acknowledge it with sincere thanks.

All departments represented in this Congress are working together toward the solution of those great problems—the causes and the nature, the prevention and the cure, of disease—which have always been and must continue to be the ultimate objects of investigation in medicine. It is this unity of purpose which gives to the history of medicine, from its oldest records to the present time, a continuity of interest and of development not possessed in equal degree by any other department of knowledge. It is this same unity of purpose which joins together into a single, effective organism the component groups of this Congress, representing, as they do, that principle of specialization and subdivision of labor which, notwithstanding its perils, has been the great factor in medical progress in modern times.

Medical science is advanced not only by those who labor at the bedside, but also by those who in the laboratory devote themselves to the study of the structure and functions of the body in health and disease. It is one of the most gratifying results of the rapid advance in medical

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education in this country during the last few years that successful workers in the laboratory may now expect some of those substantial rewards which formerly were to be looked for almost exclusively in the fields of practical medicine and surgery. We already have abundant assurance that the steady improvement in opportunities and recompense and other material conditions essential for the prosecution of scientific work in medicine will enable this country to contribute to the progress of the medical sciences a share commensurate with its great resources and development in civilization.

The subject of "Adaptation in Pathological Processes," which I have selected for my address on this occasion, is one which possesses the broadest biological, as well as medical, interests. It is this breadth of scientific and practical interest that must justify my choice of a theme which involves many technical considerations and many problems among the most obscure and unsettled in the whole range of biology and of medicine.

I shall employ the epithet "adaptive" to describe morbid processes which bring about some sort of adjustment to changed conditions due to injury or disease. In view of the more technical and restricted meaning sometimes attached to the term "adaptation" in biology, objection may be made to this broad and general application of the word in pathology; but no more suitable and convenient epithet than "adaptive" has occurred to me to designate the entire group of pathological processes whose results tend to the restoration or compensation of damaged structure or function, or to the direct destruction or neutralization of injurious agents. Processes which may be described variously as compensatory, regenerative, self-regulatory, protective, healing, are thus included under adaptive pathological processes. These processes are, in general, more or less advantageous or useful to the individual; but for reasons which will be stated later the conception of pathological adaptation and that of advantage to the individual are not wholly coextensive.

Within the limits of an address I cannot hope to do more than direct attention to some of those aspects of the subject which seem to me to be of special significance. Although most striking examples of adaptation are to be sought in comparative and vegetable pathology, what I shall have to say will relate mostly to human pathology. My purpose is not to point out the beauties or the extent of adaptations in pathological processes, but rather to say something concerning the general mechanism of their production and the proper attitude of mind regarding them, and to illustrate the general principles involved by a few representative examples.

It has been contended that the conception of adaptation has no place in scientific inquiry; that we are justified in asking only by what means

a natural phenomenon is brought about, and not what is its meaning or purpose; in other words, that the only question open to scientific investigation is How? and never Why? I hope to make clear by what follows in what light I regard this question, and in this connection I shall simply quote Lotze, who, beginning as a pathologist, became a great philosopher: "Every natural phenomenon may be investigated not only with reference to the mathematical grounds of its possibility and the causes of its occurrence, but also as regards the meaning or idea which it represents in the world of phenomena."

The most wonderful and characteristic attribute of living organisms is their active adaptation to external and internal conditions in such a way as tends to the welfare of the individual or of the species. Of the countless physiological examples which might be cited to illustrate this principle, I select, almost at random, the preservation of the normal temperature of the body in warm-blooded animals under varying external temperatures and varying internal production of heat, the regulation of respiration according to the need of the tissues for oxygen, the influence of the load upon the work performed by muscles, the accommodation of the heart to the work demanded of it, the response of glands to increased functional stimulation, the adjustment of the iris to varying degrees of illumination, the influence of varying static conditions upon the internal architecture of bone.

The most striking characteristic of these countless adaptations is their apparent purposefulness. Even if it be true, as has been said by Lange, that "the formal purposefulness of the world is nothing else than its adaptation to our understanding," it is none the less true that the human mind is so constituted as to desire and seek an explanation of the adaptations which it finds everywhere in organic nature. From the days of Empedocles and of Aristotle up to the present time there have been two leading theories to explain the apparent purposefulness of organic nature—the one, the teleological, and the other, the mechanical theory. The teleological theory, in its traditional signification, implies something in the nature of an intelligence working for a predetermined end. So far as the existing order of nature is concerned, the mechanical theory is the only one open to scientific investigation, and it forms the working hypothesis of most biologists. This theory, in its modern form, seeks an explanation of the adaptations of living beings in factors concerned in organic evolution. What these factors are we know only in part. Those which are most generally recognized as operative are variation, natural selection, and heredity. That additional factors, at present little understood, are concerned seems highly probable. The acceptance of the explanation of physiological adaptations furnished by the doctrine of organic evolution helps us, I believe, in the study of pathological adaptations.

As the word "teleology" has come to have, in the minds of many, so bad a repute in the biological sciences, and as I desire, without entering into any elaborate discussion of the subtle questions here involved, to avoid misconceptions in discussing subjects whose ultimate explanation is at present beyond our ken, I shall here briefly state my opinion that all of those vital manifestations to which are applied such epithets as adaptive, regulatory, regenerative, compensatory, protective, are the necessary results of the action of forms of energy upon living matter. The final result, however useful and purposeful it may be, in no way directly influences the chain of events which leads to its production, and, therefore, the character of the result affords no explanation whatever of the mechanism by which the end, whether it appear purposeful or not, has been accomplished. In every case the ultimate aim of inquiry is a mechanical explanation of the process in question. Notwithstanding valuable contributions, especially within recent years, toward such mechanical explanations, we are still far removed from the attainment of this aim.

The knowledge of the fact that the living body is possessed of means calculated to counteract the effects of injurious agencies which threaten or actually damage its integrity must have existed as long as the knowledge of injury and disease, for the most casual observation teaches that wounds are repaired and diseases are recovered from. It is no part of my present purpose to trace the history of the numerous speculations or even of the development of our exact knowledge concerning the subjects here under consideration. I cannot refrain, however, from merely referring to the important *rôle* which the conception of disease as in some way conservative or combative in the presence of harmful influences has played from ancient times to the present in the history of medical doctrines. Whole systems of medicine have been founded upon this conception, clothed in varying garb. There is nothing new even in the image, so popular nowadays, representing certain morbid processes as a struggle on the part of forces within the body against the attacks of harmful agents from the outer world. Indeed, Stahl's whole conception of disease was that it represented such a struggle between the anima and noxious agents. What lends especial interest to these theories is that then, as now, they profoundly influenced medical practice and were the origin of such well-known expressions as *vis medicatrix naturæ* and *medicus est minister naturæ*.

It is needless to say that there could be no exact knowledge of the extent of operation or of the nature of processes which restore or compensate damaged structures and functions of the body or combat injurious agents, before accurate information was gained of the organization and workings of the body in health and in disease. Although the way was opened by Harvey's discovery of the circulation of the blood, most of our precise knowledge of these subjects has been obtained during the

present century, through clinical observations and pathological and biological studies. In the domain of infectious diseases wonderful and hitherto undreamed of protective agencies have been revealed by modern bacteriological discoveries. Here, as elsewhere in medicine, the experimental method has been an indispensable instrument for discoveries of the highest importance and for the comprehension of otherwise inexplicable facts. Very interesting and suggestive results, shedding light upon many of the deeper problems concerning the nature and power of response of living organisms to changed conditions have been obtained in those new fields of experimental research called by Roux the mechanics of development of organisms, and also in part designated physiological or experimental morphology. Although we seem to be as far removed as ever from the solution of the most fundamental problem in biology, the origin of the power of living beings to adjust themselves actively to internal and external relations, we have learned something from these investigations as to the parts played respectively by the inherited organization of cells and by changes of internal and external environment in the processes of development, growth, and regeneration.

In physiological adaptations, such as those which have been mentioned, the cells respond to changed conditions to meet which they are especially fitted by innate properties, determined, we must believe, in large part by evolutionary factors. In considering pathological adaptations the question at once suggests itself whether the cells possess any similar peculiar fitness to meet the morbid changes concerned; whether, in other words, we may suppose that evolutionary factors have operated in any direct way to secure for the cells of the body properties especially suited to meet pathological emergencies. Can we recognize in adaptive pathological processes any manifestations of cellular properties which we may not suppose the cells to possess for physiological uses? This question appears to me to be of considerable interest. I believe that it can be shown that most pathological adaptations have their foundation in physiological processes or mechanisms. In the case of some of these adaptations, however, we have not sufficiently clear insight into the real nature of the pathological process nor into all of the physiological properties of the cells concerned to enable us to give a positive answer to the question.

While we must believe that variation and natural selection combined with heredity have been important factors in the development and maintenance of adjustments to normal conditions of environment, it is difficult to see how they could have intervened in any direct way in behalf of most pathological adaptations.

An illustration will make clear the points here involved. Suppose the human race, or any species of animal, to lack the power to compensate the disturbance of the circulation caused by a damaged heart-valve, and that an individual should happen to be born with the exclusive

capacity of such compensation. The chances are that there would arise no opportunity for the display of this new capacity, and it is inconceivable that the variety would be perpetuated through the operation of the law of survival of the fittest by natural selection, unless leaky or clogged heart-valves became a common character of the species. When, however, we learn that the disturbance of circulation resulting from disease of the heart-valves is compensated by the performance of increased work on the part of the heart, and that it is a general law that such prolonged extra work leads to growth of muscle, we see at once that this compensation is only an individual instance of the operation of a capacity which has abundant opportunities for exercise in normal life where the influence of natural selection and other factors of evolution can exert their full power.

In a similar light we can regard other compensatory and functional pathological hypertrophies—indeed, I believe, also to a considerable extent the pathological regenerations, inflammation, and immunity, although here the underlying factors are, of course, different.

We may, however, reasonably suppose that natural selection may be operative in securing protective adjustments, such as racial immunity, against morbific influences to which living beings are frequently exposed for long periods of time and through many generations.

These considerations help us to explain the marked imperfections of most pathological adaptations as contrasted with the perfection of physiological adjustments, although I would not be understood to imply that the absence of the direct intervention of natural selection in the former is the sole explanation of this difference. The cells are endowed with innate properties especially fitted to secure physiological adaptations. No other weapons than these same cells does the body possess to meet assaults from without, to compensate lesions, to restore damaged and lost parts. But these weapons were not forged to meet the special emergencies of pathological conditions. Evolutionary factors have not in general intervened with any direct reference to their adaptation to these emergencies. Such fitness as these weapons possess for these purposes comes primarily from properties pertaining to their physiological uses. They may be admirably fitted to meet certain pathological conditions, but often they are inadequate. Especially do we miss in pathological adjustments that co-ordinated fitness so characteristic of physiological adaptations. So true is this that the propriety of using such terms as compensation and adaptation for any results of pathological processes has been questioned.

A heart hypertrophied in consequence of valvular lesion does not completely restore the normal condition of the circulation. Experience has shown that a kidney hypertrophied in consequence of deficiency of the other kidney is more susceptible to disease than the normal organ.

What an incomplete repair of defects is the formation of scar-tissue, and with what inconveniences and even dangers may it be attended in some situations! If we look upon inflammation as an attempt to repair injury, and, therefore, as an adaptive process, with what imperfections and excesses and disorders and failures is it often associated! How often in some complex pathological process, such as Bright's disease or cirrhosis of the liver, can we detect some adaptive features, attempts at repair or compensation, but these overshadowed by disorganizing and harmful changes.

It is often difficult to disentangle in the complicated processes of disease those elements which we may appropriately regard as adaptive from those which are wholly disorderly and injurious. There are usually two sides to the shield, and one observer from his point of view may see only the side of disorder, and another from a different point of view, only that of adaptation.

The conception of adaptation in a pathological process is not wholly covered by that of benefit to the individual. I understand, as has already been said, by an adaptive pathological process one which in its results brings about some sort of adjustment to changed conditions. This adjustment is usually, wholly or in part, advantageous to the individual; but it is not necessarily so, and it may be harmful. The closure of pathological defects by new growths of tissue is a process which must be regarded as adaptive. But one would hardly describe as advantageous the scar in the brain which causes epilepsy. A new growth of bone to fill in defects is often highly beneficial; but what grave consequences may result from thickening of the skull to help fill the space left by partial arrest in development of the brain in embryonic life or infancy! We see here, as everywhere, that "Nature is neither kind nor cruel, but simply obedient to law, and, therefore, consistent."

In turning now to the more special, but necessarily fragmentary, consideration of a few of the pathological processes in which adaptation, in the sense defined, is more or less apparent, I shall have in view the answers to those two questions, What is the meaning of the process? and How is it caused? which confront us in our investigation of all natural phenomena. At the outset it must be admitted that our insight into the nature of many of these processes is very imperfect, and that here answers to the world-old riddles Why? and How? are correspondingly incomplete and liable to err.

Although almost all of the elementary morbid processes, even the degenerations and death of cells, may, under certain conditions of the body, serve a useful purpose—the pre-eminent examples of pathological adaptation, in the sense of restoration or compensation of damaged structure or function, or the direct destruction or neutralization of injurious agents, are to be found among the compensatory hypertrophies,

the regenerations, and the protective processes. To this last ill-defined group I refer parasiticidal and antitoxic phenomena, and some of the manifestations of inflammation, and perhaps also of fever. In the last analysis these protective processes, no less than the others mentioned, must depend upon the activities of cells.

As it is manifestly impossible within the limits of a general address to attempt a detailed consideration of any large number of these adaptive pathological processes, and as such consideration would necessarily involve the discussion of many technical and doubtful points, I have thought that my purpose would be best served by the selection of a few representative examples.

The compensatory hypertrophies afford admirable illustrations of certain fundamental principles regarding adaptations in pathology which I have already stated. The hypertrophy secures a functional adjustment, often of a highly beneficial character, to certain morbid conditions. This useful purpose is attained by a succession of events determined from beginning to end by the necessary response of cells and tissues, in consequence of their inherent organization, to the changed conditions. Given the changed conditions, on the one hand, and the organization of the cells, on the other, the result must follow as surely as night follows day, and this final result influences the preceding series of events no more in the one case than in the other. That the cells possess the particular organization determining the manner of their response to these changed conditions, and, therefore, the beneficial character of the result, is dependent upon innate properties whose fitness for the purpose doubtless has been largely fixed by evolutionary factors, operating, however, mainly in behalf of physiological functions and not directly toward pathological adjustments. In correspondence with this view we find that our knowledge of the manner of production of the compensatory hypertrophies of various organs and tissues stands in direct relation to our knowledge of the physiology of the same organs and tissues.

Those compensatory hypertrophies into the mechanism of whose production we have the clearest insight are referable to increased functional activity, and are, therefore, spoken of as work-hypertrophies. This has been proved for the muscular hypertrophies and compensatory hypertrophy of the kidney; but the demonstration is not equally conclusive for the compensatory hypertrophy of other glands. I know, however, of no instance in which this factor in the explanation can be positively excluded.

The relationship between increased functional activity and hypertrophy is so evident in many cases that there is strong presumption in favor of this explanation of those glandular compensatory hypertrophies which have not as yet been clearly referred to the class of functional

hypertrophies. The very occurrence of compensatory hypertrophy of an organ may direct attention to the fact that it is endowed with definite functions, and the conditions under which the hypertrophy occurs may shed light upon the nature of these functions. I need only remind you of the significance from this point of view of the compensatory hypertrophy of the thyroid, adrenal, pituitary, and other glands with internal secretions. I fail to see why Nothnagel should consider *à priori* improbable the occurrence of compensatory hypertrophy of one sexual gland after loss of the other, even before sexual maturity, or why Ribbert, who has apparently demonstrated experimentally such an occurrence, should find it necessary to seek the explanation in reflex nervous influences or mere hyperæmia. The so-called secondary sexual characters and the changes following castration, including the influence upon a hypertrophied prostate, point to important, even if little understood, functions which for the present we can perhaps best attribute to so-called internal secretions of these sexual organs.

The name compensatory hypertrophy is sometimes applied to growths of tissue that merely take the place of another kind of tissue which has fallen out, as, for example, the growth of adipose tissue around a shrunken kidney or pancreas, or between atrophied muscle-fibres. Here there is only compensation of space, but no compensation of structure or function. Such hypertrophies and growths are described better as complementary than compensatory.

Familiar examples of pathological hypertrophies from increased work are the hypertrophy of the heart from valvular disease and other causes, that of the muscular coats of canals and bladders behind some obstruction, and that of one kidney after loss or atrophy of the other.

In order to understand fully the manner of production of work-hypertrophy of a part resulting from some morbid condition, it is essential to know the nature of the disturbances induced by the underlying morbid condition, how these disturbances excite increased functional activity of the part which becomes hypertrophied, and what the relation is between this greater activity and the increased growth of the part.

It is impossible on this occasion to go through the whole list of compensatory hypertrophies with reference to the application of these principles. In no instance can the requirements stated be completely met in the present state of our knowledge. It will suffice for an understanding of the principles involved, and it is only with these that I am now concerned, if I take a concrete example. I select the classical and best studied one—compensatory hypertrophy of the heart. I trust that I shall be pardoned for selecting so commonplace an illustration, as the main points involved must be familiar to most of my audience; but it is possible that the application made of them may not be equally familiar. The only matters essential to my present line of argument are the

mechanism of production of the hypertrophy and the general character of the adaptation thereby secured.

The heart, like other organs of the body, does not work ordinarily up to its full capacity, but it is capable of doing at least three or four times its usual work. The excess of energy brought into play in doing this extra work is called conveniently, although not without some impropriety, "reserve force." It has been proved experimentally that this storehouse of reserve power is sufficient to enable the healthy heart, at least that of a dog, to accommodate itself at once or after a few beats to high degrees of insufficiency or obstruction at its valvular orifices without alteration in the mean pressure and speed of the blood in the arteries. But even so tireless and accommodating an organ as the heart cannot be driven at such high pressure without sooner or later becoming fatigued, and consequently so dilated as to fail to meet the demands upon it. If it is to continue long the extra work, it must receive new increments of energy.

The cardiac muscle is far less susceptible to fatigue than the skeletal muscles, but that it may become fatigued seems to me clear.

Leaving out of consideration some doubtful causes of cardiac hypertrophy, such as nervous influences, the various morbid conditions which lead to this affection are such as increase either the volume of blood to be expelled with each stroke, or the resistance to blood-flow caused by the pressure in the arteries or by narrowing at one of the valvular orifices, or both. Unless some regulating mechanism steps in, each of these circulatory disturbances must increase the resistance to contraction of the cardiac muscle, and it is evident that the heart must do extra work if it is to pump the blood through the arteries with normal pressure and speed. It is, however, no explanation of this extra work simply to say that it occurs because there is demand for it. Increased work by the heart in cases of disease of its nutrient arteries would often meet a most urgent demand on the part of the body, but here the heart flags and fails.

The physiologists have given us at least some insight into the mechanism by which the heart responds through increased work to the circulatory disturbances which have been mentioned. These disturbances all increase the strain on the wall of one or more of the cavities of the heart; in other words, increase the tension of the cardiac muscle, in much the same way as a weight augments the tension of a voluntary muscle. Now it is a fundamental physiological law that with a given stimulus greater tension of a muscle, within limits, excites to more powerful contraction, and thus to the performance of greater work. It seems clear that this law applies to the muscle of the heart, as well as to voluntary muscle. We do not know precisely how increased tension facilitates the expenditure of greater muscular energy.

Another well-known fact in the mechanics of muscle is of importance in this connection. With increase of muscular tension under a given stimulus a point is reached where the extent of contraction is diminished, although the mechanical work done, determined by multiplying the height to which the load is lifted by the weight of the load, is increased. This law applied to the heart, whose contractions are always maximal for the conditions present at any given time, signifies that, with increased resistance to the contraction of the muscular wall of one of its cavities, this cavity will empty itself during systole less completely than before. In other words, dilatation occurs, and, as has been shown by Roy and Adami, to whom we owe important contributions on this as well as on many other points relating to the mechanics of the heart, dilatation regularly antedates hypertrophy. This primary dilatation, however, is not to be looked upon as evidence of beginning heart-failure, for, as these investigators have pointed out, it is within limits only an exaggeration of a physiological condition, and can be subsequently overcome by hypertrophy, which, in consequence of increase in the sectional area of the muscle, lessens the strain upon each fibre, and thereby permits it to shorten more during contraction. If this result is completely secured, we have simple hypertrophy. More often the dilatation remains, and must necessarily remain, and we have excentric hypertrophy, which secures, for a time at least, adequate, but I do not think we can say perfect, compensation.

The weight of existing evidence favors the view that the power of the heart to adapt its work to the resistance offered resides primarily in its muscle-cells, and not in intrinsic or extrinsic nervous mechanisms, although doubtless these latter in various ways, which cannot be here considered, influence and support this regulating capacity. Nor can I here pause to discuss the influence of blood-supply to the cardiac muscle upon the force of ventricular contraction, although Porter has demonstrated that this is important.

In tracing the steps from the primary morbid condition to the final hypertrophy, we have thus far had to deal mostly with known mechanical factors. We now come to the question, How does increased functional activity lead to increased growth?

Inasmuch as greater functional activity is regularly associated with a larger supply of blood to the more active part, the view advocated by many that the increased growth is the direct result of this hyperæmia, and one often encounters, especially in biological literature, this opinion expressed as if it were an indisputable fact. There is, however, no conclusive proof of this doctrine, and many facts speak against it. The examples from human pathology commonly cited to support the doctrine that local active hyperæmia incites growth of cells are, so far as I am able to judge, complicated with other factors, such as injury, inflam-

mation, or trophic disturbances. Transplantation-experiments, such as John Hunter's grafting the cock's spur upon the cock's comb, sometimes adduced in this connection, are not decisive of this question, for here a new circumstance is introduced which some suppose to be the determining one for all morbid cell-growth, namely, the disturbance of the normal equilibrium between parts. Local active hyperæmia may exist for a long time without evidence of increased growth in the congested part. To say that the hyperæmia must be functional is at once to concede that it is not the sole factor. Experiments from Bizzozero's laboratory, by Morpurgo and by Penzo, indicate that local hyperæmia due to vasomotor paralysis, or to the application of heat, favors cell-multiplication in parts where proliferation of cells is a normal phenomenon or is present from pathological causes, but that it is incapable of stimulating to growth cells whose proliferating power is suspended under physiological conditions, as in developed connective tissue, muscles, and the kidneys.

It has been usually assumed that the way in which local hyperæmia may stimulate cell-growth is by increasing the supply of nutriment to cells. The trend of physiological investigation, however, indicates that the cell to a large extent regulates its own metabolism. If the cell needs more food, of course it cannot get it unless the supply is at hand, and in this sense we can understand how a larger supply of blood may be essential to increased growth, but this is a very different thing from saying that the augmented blood-supply causes the growth.

It is by no means clear that the question as to the influence of increased blood-supply upon cell-growth is identical with that of increased lymph-supply. The experiments of Paschutin and of Emminghaus, from Ludwig's laboratory, nearly a quarter of a century ago, indicate that local hyperæmia due to vasomotor paralysis does not, as a rule, increase the production of lymph; and more recent experiments, although not wholly concordant in their results upon this point, tend to the same conclusion. Functional activity, however, has a marked influence in increasing the quantity and affecting the quality of lymph in the active part. Our knowledge of the physical and chemical changes in working muscles and glands enables us to conceive why this should be so, for all are now agreed that the formation of lymph is due not simply to filtration from the blood-plasma, but also to diffusion, and some believe likewise to active secretion by the capillary endothelium. Doubtless arterial hyperæmia is essential to the maintenance of the increased flow of lymph in working organs.

There are difficulties in the way of supposing that increased supply of lymph in itself furnishes the explanation of cell-growth, and especially of that which characterizes hypertrophy of muscles and glands. Pathologists have frequent opportunities to study the effects of all degrees of increased production and circulation of lymph associated

with venous hyperæmia. A kidney or a muscle may from this cause be subjected for months and years to an excess of lymph-flow, but there is no demonstration of any consequent hypertrophy or hyperplasia of renal epithelium or muscle-cell. It is true that the chemical composition of the lymph is not the same as that of lymph resulting from increased function, and it is possible that in this chemical difference lies the kernel of the whole matter. It may also be urged that in venous hyperæmia there are circumstances which restrain or prevent growth. Nevertheless, if overfeeding, merely in consequence of increased supply of nutriment, were the real explanation of work-hypertrophies, one would expect to find some evidence of this in the class of cases mentioned.

Ribbert has recently given a new shape to the doctrine that local hyperæmia excites growth. While rejecting the usual explanation that it does so by supplying more food, he contends that distention of the bloodvessels and lymph-spaces, by mechanically disturbing the mutual relations of parts, removes obstacles to growth. This theory cannot be advantageously discussed until the fact is first established that uncomplicated local hyperæmia does incite growth.

As the matter now stands, it seems to me that any satisfactory explanation of the cell-growth causing work-hypertrophies must start from physical or chemical changes in the muscle- or gland-cell itself directly connected with the increased function. These changes are the *primum mobile*, and, however important increased supply of blood or lymph may be in the subsequent chain of events, it is not the determining factor. The whole problem is part of the general one of the causes of pathological cell-growth, to which I shall have occasion to refer again.

It is interesting to note that not all kinds of excess of functional activity lead to hypertrophy. A heart may beat for years faster than normal without becoming hypertrophied. Small movements of muscle, often repeated, do not cause hypertrophy. It would appear that the amount of work done in each functional act must attain a certain height in order to stimulate growth. On the other hand, if the muscle be stretched beyond certain limits, it does not hypertrophy; on the contrary, it may atrophy, as may be seen in greatly distended canals and cavities with muscular walls. This behavior is also in accordance with physiological observations.

The compensatory hypertrophy of muscle seems to be due mainly to increase in the size of cells, although there are observations indicating that they may also multiply. That of most glands is referable to increase both in number and size of cells. Within four or five days after extirpation of a kidney karyokinetic figures may be found in increased number in the cells of the remaining kidney.

The general character of the adaptation secured by compensatory hypertrophy of the heart is sufficiently well known. I wish to point

out certain of its imperfections. I shall not dwell upon the well-known abnormal conditions, with their remote consequences, of the systemic or pulmonary circulation, which are present during the stage of compensation, nor shall I speak of the various circumstances which may interfere with the establishment of compensatory hypertrophy.

The muscle of a hypertrophied heart is sometimes compared to that of the blacksmith's arm, and the statement is made that there is no reason inherent in the muscle itself why the one should fail more than the other. This may be true, but it is not self-evident. Exercise may influence in various ways the nutrition, function, and growth of muscle as well as of other parts. Mere increase in bulk is a coarse effect. Quality may be improved as well as quantity. The biggest muscle is not necessarily the best or the most powerful. As every trainer knows, various conditions under which work is done influence the result. Increase in the reserve energy of the heart, secured by judicious exercise—and this is the main factor in endurance—probably cannot be attributed mainly to hypertrophy; indeed, enlargement of this organ from exercise is often a serious condition. Much more might be said in this line of thought, but I have indicated why it seems to me unjustifiable to assume, without further evidence, that the condition of the muscle in pathological hypertrophies is necessarily identical in all respects with that in physiological hypertrophies.

There is an important difference in the working-conditions between most hypertrophied hearts and the normal heart. Although the maximal available energy of a hypertrophied heart during compensation is greater than that of the normal heart, clinical experience shows that in the majority of cases the energy available for unusual demands—that is, the so-called reserve force—is less in the former than in the latter. Sometimes, especially when the hypertrophy has developed in early life, the hypertrophied heart is at no disadvantage in this respect. As pointed out with especial clearness by Martius, the significance of this alteration in the ratio normally existing between the energy expended for ordinary needs and that available for unusual demands, is that it furnishes an explanation of the greater liability of the hypertrophied heart to tire upon exertion. Fatigue of the heart is manifested by dilatation of its cavities, and when this dilatation from fatigue is added to that already existing in most cases, relative insufficiency of the mitral or tricuspid valve is likely to occur, and the compensation is, at least for a time, disturbed. The circulation through the coronary arteries, whose integrity is so important for the welfare of the heart, is impaired, and a vicious circle may be established. Notwithstanding the valuable contributions from the Leipzig clinic as to the frequency of various anatomical lesions in the muscle of hypertrophied hearts, it does not seem to me necessary to have recourse to them as an indispensable factor in the explanation of

the breakage of compensation; but I shall not here enter into a discussion of the general subject of the causes of failure of compensation.

I have described with some detail, although very inadequately, the manner of production of compensatory hypertrophy of the heart, in order, by this representative example, to make clear what seem to me to be certain general characteristics of many adaptive pathological processes, and I beg here to call attention especially to the following points. As has been emphasized by Nothnagel and others, no teleological idea or form of language need enter into the explanation of the mechanism of the process. The final result is the necessary consequence of the underlying morbid conditions. We have satisfactory mechanical explanations for essential steps in the process, and there is no reason to assume that other than mechanical factors are concerned in those vital manifestations which at present we are unable to explain by known physical and chemical forces. The properties of the cells which determine the character of their response to the changed conditions are none other than their well-known physiological properties. The adaptation finally secured, admirable as it is in many respects, and perhaps adequate for a long and active life, is generally attended with marked imperfections, and, strictly speaking, is not a complete compensation. It does not present that co-ordinate and special fitness which we are accustomed to find in physiological adaptations, for the explanation of which so much has been gained by the study of the factors concerned in organic evolution.

It may be argued that under the circumstances no better kind or degree of adaptation can be conceived of than that which actually occurs, and that the operation of evolutionary factors, with especial reference to the adjustment of the organism to the conditions causing cardiac hypertrophy, could not secure any better result. I think that it is not difficult to conceive how improvements might be introduced. It is, however, permissible to suppose that the introduction into the workings of the organism of some better mechanism to compensate the morbid conditions might be at the sacrifice of more important physiological attributes of the body. More perfect pathological adaptations might in many instances involve a deterioration of the physiological characters of the species. It is often the case that the more highly organized living beings lack some capacity possessed by those lower in the scale of organization to resist or compensate injury and disease. This is notably true of the power to regenerate lost parts. It is, however, along the lines of improvement in the physiological characters of the individual or species that the opportunity often lies for securing increased resistance to disease or better pathological adaptations.

It would be interesting to continue our consideration of the compensatory hypertrophies by an examination of those of glandular organs from points of view similar to those adopted for the heart. For the kidney,

at least, the materials are at hand for such a purpose; but, as I desire in the limited time at my disposal to touch upon other varieties of pathological adaptation, I must refer those interested especially to the investigations of Grawitz and Israel, Ribbert, Nothnagel, and Sacerdotti as to the conditions underlying compensatory hypertrophy of the kidney. I can likewise merely call attention to the interesting researches of Ponfick upon the most wonderful of the compensatory hypertrophies in higher animals, that of the liver. Ponfick, as is well known, has demonstrated that after removal of three-fourths of this organ new liver-substance, with normal functions, is recreated from the remainder and to an amount nearly equalling that which was lost.

The chapter of pathological adaptations in bones and joints I shall leave untouched, notwithstanding the admirable illustrations which might be drawn from this domain.

There is no more fascinating field for the study of pathological adaptations with reference to the mechanical factors involved than that furnished by the bloodvessels, as has been shown especially by the brilliant researches of Thoma. With wonderful precision can a vessel or system of vessels adjust itself to changes in the pressure, velocity, and quantity of blood, and thereby serve the needs of the tissues for blood. Under pathological, as well as physiological, conditions this adjustment may be brought about not only through the agency of vasomotor nerves and the physical properties of the vascular wall, but also, when the necessity arises, by changes in the structure of the wall.

The changes in the circulation introduced by the falling out of the placental system at birth are essentially the same as those resulting from amputation of an extremity, and the consequent alterations in the structure of the umbilical artery are identical with those in the main artery of the stump after amputation. The closure of the ductus Botalli and the ductus venosus soon after birth, and, still better, transformations of vessels in the embryo, furnish physiological paradigms for the development of a collateral circulation. Many other illustrations might be cited, did time permit, to show that in the processes of normal development, growth and regressive metamorphosis of parts, both before and after birth, and in menstruation and pregnancy, changed conditions of the circulation arise analogous to certain ones observed under pathological circumstances, and that the mode of adjustment to these changes by means of anatomical alterations in the vessels may be essentially the same in the physiological as in the morbid state. I see in these facts an explanation of the relative perfection of certain vascular adaptations to pathological or artificial states, as may be exemplified by changes in a ligated artery and by the development of a collateral circulation. The mechanisms by which the adjustments are secured have, in consequence of their physiological uses, for reasons already explained, a special

fitness to meet certain pathological conditions. That this fitness should be greater in youth than in old age is in accordance with laws of life, indicated with especial clearness by Minot in his interesting studies on "Senescence and Rejuvenation."

But these mechanisms are not equally well adapted to meet all morbid changes in the vessels. Although Thoma's interpretation of the fibrous thickening of the inner lining of vessels in arteriosclerosis and aneurism as compensatory, or, as I should prefer to say, adaptive, is not accepted by all pathologists, it seems to me the best explanation in many cases. But the adaptation, if it be such, is here usually of a very imperfect nature, and it is not surprising that it should be so, when one considers the improbability of any mechanism developing under physiological conditions which should be specially fitted to meet the particular morbid changes underlying aneurism and arteriosclerosis.

I shall not be able to enter into a consideration of the mechanical factors concerned in adaptive pathological processes in bloodvessels, although perhaps in no other field are to be found more pertinent illustrations of the views here advocated concerning pathological adaptations. The whole subject has been studied from the mechanical side most fully and ably by Thoma, whose four beautifully simple histo-mechanical principles are at any rate very suggestive and helpful working-hypotheses, even if it should prove, as seems to me probable, that they are too exclusive. I shall call attention in this connection only to the inadequacy of the old and still often adopted explanation of the development of a collateral circulation. The rapidity with which a collateral circulation may be established after ligation of a large artery, even when the anastomosing branches are very small, is known to every surgeon. This was formerly attributed to increase of pressure above the ligature; but this rise of pressure has been shown to be too small to furnish a satisfactory explanation, and Nothnagel has demonstrated that there is little or no change in the calibre of arteries coming off close above the ligature unless they communicate with branches arising below the ligature. Von Recklinghausen several years ago suggested a better explanation. The bed of the capillary stream for the anastomosing arteries is widened by ligation of the main artery, inasmuch as the blood can now flow with little resistance from the capillaries of the anastomosing branches into those of the ligated artery. The result is increased rapidity of blood-flow in the anastomosing vessels. According to one of Thoma's histo-mechanical principles, increased velocity of the blood-current results in increased growth of the vessel-wall in superficies—that is, in widening of the lumen. The tension of the vessel-wall, which is dependent on the diameter of the vessel and the blood-pressure, is, according to Thoma, thus increased; and, according to another of his principles, this greater tension results in growth of the

vascular wall in thickness. The changes in the walls of the anastomosing vessels seem to me best interpreted as referable to a genuine work-hypertrophy, a conception which has already been advanced by Ziegler.

The pathological regenerations constitute a large group of adaptive morbid processes of the highest interest. Their study has become almost a specialized department of biology, and occupies a very prominent place in the extensive literature of recent years relating to experimental or physiological morphology. It has revealed in unexpected ways the influence of external environment upon the activities of cells, as is illustrated in a very striking manner by Loeb's studies of heteromorphosis.

Although the capacity to regenerate lost parts must reside in the inherited organization of the participating cells, there are observations which seem to indicate that in the lower animals this capacity may exist independently of any opportunity for its exercise during any period of the normal life of the individual or species or their ancestors, including the period of embryonic development. This is the inference which has been drawn from Wolff's observation, that after complete extirpation of the ocular lens with the capsular epithelium in the larval salamander, a new lens is reproduced from the posterior epithelium of the iris. There are other observations of similar purport. The acceptance of this inference, however, seems to me to involve such difficulties that we may reasonably expect that further investigations will afford more satisfactory explanations of these curious and puzzling phenomena of regeneration. Of much interest and significance are the so-called atavistic regenerations, where the regenerated part assumes characters belonging not to the variety or species in which it occurs, but to some ancestral or allied species. For these and other reasons Driesch refers the pathological regenerations to what he calls the secondary self-regulations, by which term he designates those adjustments of artificially induced disturbances which are brought about by factors foreign to the normal development and life of the individual.

The view advocated by Barfurth seems to me more probable, that the pathological regenerations depend upon cellular properties pertaining to the normal life of the organism. This view is supported by the fact that, with a few probably only apparent exceptions, the regenerations conform to the law of specificity of cells. The pathological regenerations occurring after birth can be referred to the retention in greater or less degree of formative powers possessed by the cells pre-eminently in embryonic life. These powers in general tend gradually to diminution or extinction as the individual grows older, although in some cells, such as the covering epithelium of the skin and mucous membranes, this loss of regenerative power with advancing years is scarcely manifest. Even after the cessation of growth the regenerative capacity is not wholly in

abeyance under physiological conditions. Bizzozero has studied and classified the various tissues of the body according to the activity of their physiological regeneration.

In general, the more highly differentiated and specialized a cell, the less is its capacity for regeneration; but we now know that such differentiation is attended with less sacrifice of its regenerative power than was once supposed. Even such highly specialized cells as those of striped muscle are capable of regeneration. Indeed, the nerve-cells seem to be the only ones incapable of proliferation, and even this is not certain, for there are competent observers who claim that these cells may multiply, although there is no evidence that in the higher animals they can give rise to functionally active new nerve-cells. The ease with which a part of the nerve-cell, namely, its axis-cylinder process, can be regenerated is well known.

The cell-proliferation in regeneration is attributed to the removal of resistance to growth in consequence of the defect resulting from loss of tissue. It has been pointed out, especially by Ziegler and by Ribbert, that not only cells in the immediate neighborhood of the defect multiply, but likewise those at such a distance that it is difficult to suppose that the latter have been directly influenced by the loss of tension in the tissues caused by the defect. Ziegler refers the proliferation of the distant cells to compensatory hypertrophy, and Ribbert attributes it to hyperæmia resulting from the presence in the defect of foreign materials, such as extravasated blood, exudation, and necrotic tissue.

We are brought here, as we were in the consideration of the compensatory hypertrophies, to one of the most fundamental and important questions in pathology—the causes of pathological cell-growth. The interpretation of many pathological processes as adaptive or not, hinges often upon opinions held concerning the underlying causes of cell-proliferation. The main question at issue is, How far one is willing to go in attributing cell-growth to primary defects in the tissue, and interpreting the growth as for the purpose of regeneration or filling up a defect? Differences of opinion upon this subject are illustrated by the different interpretations of the cell-proliferations in acute and chronic inflammations, some pathologists considering these to be essentially regenerative and compensatory; others regarding them, at least in large part, as directly incited by inflammatory irritants and not to be ranked wholly with the regenerative processes.

The doctrine of Virchow was long accepted without question, that inflammatory cell-growth is the result of the action of external stimuli, the so-called inflammatory irritants, upon the cells, which are thereby directly incited to grow and multiply. The attack upon this doctrine has been most vigorously led by Weigert, who denies absolutely the power of any external agencies to stimulate directly cells to prolifera-

tion. He considers that to concede such a bioplastic power to external agents is equivalent to the acceptance of a kind of spontaneous generation of living matter.

Weigert's views upon this subject have undoubtedly had a most fruitful influence upon pathology. It has been such an influence as a good working-hypothesis, whether finally demonstrated to be true or not, has often had in the development of science. In putting to the test of actual observation Weigert's hypothesis, we have been led to recognize the frequency and the importance of primary injuries to cells inflicted by external agencies. Not only various degenerations and necroses of entire cells, but more subtle and partial damage of cytoplasm and nucleus have been made the subject of special study. It has been recognized that our older methods of hardening tissues reveal often only very imperfectly the finer structure of cells, and new and better methods have been introduced which enable us to detect more delicate lesions of cell-substance which formerly escaped attention, as is well illustrated in recent studies in neuropathology. Weigert's postulate of some primary injury to the tissues as the immediate effect of mechanical, chemical, and other external agencies, which were formerly regarded as the direct stimuli of cell-growth and multiplication, has been fulfilled in many instances where such damage had previously been overlooked or unsuspected. It is his belief that in cases where we cannot now detect such primary injury more thorough search and better methods will enable us to do so. One may, of course, reasonably cherish such an expectation; but at the same time we must recognize the fact that morbid cell-proliferations occur under circumstances where we cannot at present associate them with any demonstrable injury to the tissues—indeed, in some cases where our insight into the structure of the part seems to be so clear and satisfactory that one is very reluctant to admit the existence of an undetected damage to the cells.

Perhaps the most important modification of former pathological conceptions, resulting from the belief that cell-growth is caused by primary defects and injuries of tissue, relates to the chronic interstitial inflammations or fibroid processes. The older view that in these processes the active and essential feature of the disease is the new growth of connective tissue, which strangled the more highly organized cells of the part, has been replaced to a large extent by the opinion that the primary and most important lesion is the degeneration, atrophy, or necrosis of the more specialized cells, whose place is taken by the new growth of interstitial tissue. In many instances, as in fibroid patches in the myocardium, and in many scleroses of the central nervous system, this latter conception affords the best and most natural interpretation of the facts. There are, however, great difficulties in explaining all chronic interstitial inflammations by this doctrine, and I must take side with those who

admit the occurrence, for example, in the kidney and in the liver, of primary interstitial inflammations characterized by proliferation of the connective tissue and endothelial cells.

Indeed, it seems to me that Weigert's formula is too narrow to cover all of the observed facts concerning cell-proliferation. Essential features of the theory that cells cannot be directly stimulated to growth by external agents were present in Boll's doctrine of border warfare between neighboring cells. Weigert's presentation of this theory is in a far more acceptable shape than that of Boll. A still more comprehensive statement of the general theory is that cells are incited to growth through removal of obstacles to growth in consequence of some disturbance in the normal relations or equilibrium of the cells with surrounding parts. The capacity to proliferate must be present in the cells, but with the cessation of growth this capacity is rendered latent or potential by the establishment of definite relations or an equilibrium between cells and neighboring parts, including under the latter not only adjacent cells, but also basement-substance, lymphatics, bloodvessels, tissue-juices, chemical substances, etc. It is evident that under these circumstances in only two ways can the cells be incited to growth, either by removal of resistance or obstacles to growth, or by an increase in the formative energy resident within the cell, and that in either way energy must be used, whether it be employed to remove obstacles to growth or to increase the proliferative forces within the cell.

It appears to me by no means an easy matter to decide in all cases in which of the two ways mentioned cell-proliferation is brought about. Removal of obstacles to growth, not only in the way indicated by Weigert, but also by other disturbances in the neighborhood-relations of the part, and very probably by the presence of definite chemical substances, may be the explanation of all pathological cell-growths. Certainly it would not be easy conclusively to disprove this view. Nevertheless, I fail to comprehend the inherent difficulties which some find in admitting the possibility of forms of energy, acting from without, directly increasing the formative energy of the cell; in other words, directly stimulating the cell to growth and multiplication. If such a possibility be admitted, the natural interpretation of some examples of cell-proliferation is that they are directly caused by the action of external forces, in the sense advocated by Virchow.

Students of the problems of pathological cell-growth must take into consideration not only the facts of human and allied pathology, but also those which are so rapidly accumulating in the domain of experimental embryology and morphology, to the importance of which I have repeatedly referred in this address. I would call attention especially to the observations from this source as to the influence of various changes of environment, particularly of definite chemical, thermic, and mechan-

ical changes in surrounding parts, upon the direction of movement and of growth of cells. The use at present made of chemotactic phenomena in explaining the direction of movement of cells in human pathological processes is only a very limited and inadequate application of these important observations concerning tactic and tropic stimuli. We shall probably come to realize more and more the operation of these factors in determining cell-movements and cell-growth in human pathology. We already have evidence that different kinds of leucocytes not only possess different specific functions, but also respond in different ways to definite tactic stimuli. The long-standing problem of the lymphoid cell in inflammation approaches solution along these lines of investigation.

A burning question, and one of perennial interest, relating to our subject is: How far are we justified in regarding acute inflammation as an adaptive or protective morbid process? There is fair agreement as to the essential facts of observation, but regarding their interpretation there are wide differences of opinion, and when one considers the complexity of the process and its still unsolved riddles, it is not hard to see why this should be so. Much depends upon the point of view, and in this respect there can be recognized a certain antagonism between the purely clinical and the purely pathological and experimental views, an antagonism, however, which must be reconciled by a full knowledge of the subject.

It is not likely that the purely clinical study of inflammation would ever lead to the idea that the general tendency of this process is advantageous to the patient. The more severe and extensive the inflammatory affection, the more serious, as a rule, is the condition of the patient. The surgeon sees his wounds do well or ill according to the character and extent of inflammatory complication. Measures directed to the removal of inflammatory exudation, such as the evacuation of pus from an abscess or an empyema, are the most successful methods of treatment, and the rules are embodied in ancient surgical maxims. How can one conceive of any purpose useful to the patient served by filling the air-cells of his lung with pus-cells, fibrin, and red corpuscles in pneumonia, or bathing the brain and spinal cord in serum and pus in meningitis? If nature has no better weapons than these to fight the pneumococcus or meningococcus, it may be asked, "What is their use but to drive the devil out with Beelzebub?"

But the pathologist and bacteriologist sees another aspect of the picture. An infectious micro-organism has invaded the tissues, where it multiplies and where its toxic products begin to work havoc with the surrounding cells, and by their absorption to cause constitutional symptoms and perhaps damage to remote parts. Is the destructive process to go on without any defence on the part of the body? There is attracted to the injured part an army of leucocytes from the bloodves-

sels, and perhaps other cells, from the neighboring tissues, and it has been conclusively shown that these cells can pick up foreign particles and remove them, and that they contain substances capable of destroying many micro-organisms. At the same time serum accumulates in and around the injured area, and this may aid by its chemical properties in destroying bacteria, in diluting poisons, in flushing out the part. Fibrin may appear, and some think that this may serve in some situations as a protective covering. If these agencies, hostile to the invading micro-organism, gain the upper hand, the débris is cleared away by phagocytes and other means, and the surrounding intact cells, which had already begun to multiply, produce new tissue which takes the place of that which had been destroyed. The victory, however, is not always with the cells and other defensive weapons of the body. The struggle may be prolonged, may be most unequal, may cover a large territory, and the characters and extent of the inflammation furnish an index of these different phases of the battle.

Such in bald outlines are two divergent views of inflammation.

I do not see how we can fail to recognize in that response to injury, which we call inflammation, features of adaptation. Inflammation may be in some cases the best response to secure the removal or destruction of injurious agents, but we cannot look upon it as the most perfect mode of protection of the body against invading micro-organisms. One may inoculate into three animals, even of the same species, but possessed of different individual resistance, the same quantity of the same culture of a pathogenic micro-organism and obtain sometimes the following results: The first one will present no appreciable inflammatory reaction whatever, and no evidences of any other disturbance, and examination will show that the micro organisms have quickly disappeared. The second one will develop an extensive local inflammation and survive, but after a long illness. The third one will offer little resistance to the micro-organism, which rapidly multiplies without causing marked inflammation, invades the blood or produces toxæmia, and quickly destroys the life of the animal. Now, it is evident that the best protective mechanism is that brought into action by the first animal, but that the inflammatory reaction set up in the second one is better than the absence of reaction and of other defences in the third animal.

I can scarcely do more on this occasion than to indicate some of the points of view from which it seems to me that we can best approach the study of inflammation as an adaptive process. With inflammation, as with other adaptive processes, any useful purpose subserved affords no explanation of the mechanism of the process. We should guard against all ideas which introduce, even unconsciously, the conception of something in the nature of an intelligent foresight on the part of the participating cells. The response of these cells in inflammation is a necessary

and inevitable one determined by their innate properties. Our efforts should be directed, in the first place, toward as near an approach as possible to a mechanical explanation of inflammatory processes by a study, on the one hand, of the properties and mode of action of the causes of inflammation, and, on the other hand, of the nature and source of the cellular properties concerned. We may properly inquire whether these properties fit the cells to counteract the effects of injury, and if so, whence comes this fitness. Has the fitness those attributes of relative perfection which we find in most physiological adaptations, or is it characterized by the uncertainties and imperfections of so many pathological adaptations? Is the character of the response to injury in inflammation such as to indicate that the agencies concerned have acquired through evolutionary factors a special fitness to meet the pathological emergencies? Are all or only a part of the manifestations of the inflammatory processes adaptive?

It cannot be doubted that there are innate properties of certain cells called into action in inflammation, such as those manifested in the attraction of leucocytes and other cells by definite chemical substances, the capacity of cell-proliferation from causes connected with injury, the power of phagocytosis and other bactericidal properties, which may be adapted to counteract the effects of injurious agents. When these forces bring about the prompt destruction or removal of the injurious substances and the defect is quickly repaired, the adaptation is complete and unmistakable. When, however, the inflammatory irritants and their destructive effects persist, and the proliferation of cells and accumulation of inflammatory products become excessive and occupy large areas, the features of adaptation are not so easily recognized. The mere occupation of territory by inflammatory products is often a serious injury and it can be regarded as an adaptive feature only when they fill some artificial defect. Such occupation may be in itself enough to counteract any useful work in which these products may be engaged.

We can reasonably seek in the relations of the body to the outer world an explanation of the development of certain properties of cells which serve a useful purpose in mechanical and other injuries. These properties find application also in the normal life of the organism. Their exercise in response to injury imparts to inflammation important adaptive or protective characteristics, but I fail to see in this process any such special fitness as would justify extravagant statements which have been made to the effect that inflammation ranks among the adaptations of living beings by the side of digestion and respiration.

I have endeavored in this address to present certain general considerations concerning pathological adaptations. It has been possible to bring under consideration only a small part of an immense field, and this very inadequately. We have seen that in the sense in which adap-

tation was defined we can recognize in the results of morbid processes frequent and manifold evidences of adjustment to changed conditions. These adjustments present all degrees of fitness. Some are admirably complete; more are adequate, but far from perfect; many are associated with such disorder and failures that it becomes difficult to detect the element of adaptation. The teleological conception of a useful purpose in no case affords an explanation of the mechanism of an adaptive process. I have suggested that the adaptability of this mechanism to bring about useful adjustments has been in large part determined by the factors of organic evolution, but that in only relatively few cases can we suppose these evolutionary factors to have intervened in behalf of morbid states. For the most part, the agencies employed are such as exist primarily for physiological uses, and while these may be all that are required to secure a good pathological adjustment, often they have no special fitness for this purpose.

The healing power of nature is, under the circumstances present in disease, frequently incomplete and imperfect, and systems of treatment based exclusively upon the idea that nature is doing the best thing possible to bring about recovery or some suitable adjustment, and should not be interfered with, rest often upon an insecure foundation. The agencies employed by nature may be all that can be desired; they may, however, be inadequate, even helpless, and their operation may add to existing disorder. There is ample scope for the beneficent work of the physician and surgeon.

CANCER OF THE STOMACH IN EARLY LIFE,

AND THE VALUE OF CELLS IN EFFUSIONS IN THE DIAGNOSIS OF CANCER OF THE SEROUS MEMBRANES.[1]

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"C. McK., aged twenty years, farmer, born in Michigan, was admitted to the University Hospital October 21, 1896. He complained of an "obstruction in the gullet," pain in the epigastrium, between the shoulders and in the small of the back.

History. The family history is negative as to new-growth and tuberculosis. The father (aged seventy-five years) and mother (aged fifty-three years) are alive and well. There are four brothers and four sisters living and well.

The patient was well up to October, 1895, not having had the common diseases of childhood. At the time given he had a pain in the epigastrium and the lower part of the thorax, so severe as to cause him to

[1] Read before the Association of American Physicians at the meeting in Washington, May 4-6, 1897.

"double up." At the same time there was a choking sensation in the throat, and a good deal of mucus was raised. A week later difficulty in swallowing was noticed. The food seemed to stop in the throat, and an effort was required to pass it down. This persisted to the present time. Frequently the food comes up with some force as soon as swallowed. For some time it has been impossible to swallow solid food, except after careful mastication. The patient denies actual vomiting; says he has never vomited blood. For the first six months there were almost daily attacks of "cramp" in the epigastrium. In February the patient had measles. This left him weak, and he was unable to walk for three weeks. In March the abdomen began to enlarge. Much flatus was passed; the bowels were constipated. After that the patient improved, gaining strength; but in August he again became weak. Two weeks before admission the legs began to swell. From the beginning of the disease the patient had to pass water two or three times at night. During the last two weeks the quantity of urine has diminished.

The appetite is good. The bowels are very constipated; sometimes there is no stool for two weeks.

Present condition, October 23, 1896: slender frame, of medium size; extreme emaciation; skin dry, harsh, very pale, as are also the visible mucous membranes. No jaundice; no cyanosis. There is œdema of the legs, the dependent parts of the thighs, and in the back from the sacrum to the lower dorsal region. The œdema is soft, the skin over it glossy. The nails are curved, but the fingers not clubbed.

The mind is clear; the voice weak. The special senses are normal; the eyes lustreless; expression weary. The tongue is small, smooth for the most part, but with irregular, elevated white patches on the middle and sides. The gums are red and slightly ulcerated.

The lymph-nodules in the supraclavicular regions are slightly enlarged.

The thorax is long, narrow, and flat; the expansion slight, but symmetrical. Percussion of the upper parts of the thorax alike on both sides. In front the note is short and high pitched. In the back dulness begins on the line of the ninth dorsal spine on both sides. Auscultation reveals weak vesicular breathing all over, with no adventitious sounds. In the dorsal position the liver-dulness cannot be made out. On sitting up dulness is encountered on the fifth rib in the nipple-line, moving freely with respiration. An inch lower down tympanitic resonance is obtained.

In the left axillary line stomach tympany is found on the fifth rib.

The apex-beat is in the fourth interspace one cm. inside the nipple-line. Heart dulness begins in the third intercostal space, extends from the left edge of the sternum within a centimetre of the nipple. The sounds at the apex are weak but clear. The second pulmonary sound is accentuated. The radial pulse is small, soft, regular.

The abdomen is much distended, measuring thirty inches at the umbilicus. There is tympanitic resonance all over the front to within three finger-breadths of the os pubis. The right flank is tympanitic. In the left flank there is dulness up to the anterior axillary line. On sitting, dulness reaches to the umbilicus. There is fluctuation. Palpation of the abdomen negative, the walls being extremely tense.

The splenic dulness, when the patient lies on the right side, is found in the normal position, measuring four by two centimetres.

Examination of the pharynx negative. A soft stomach-tube, 1.1 cm.

in diameter, is swallowed easily for 39 cm. (from the upper incisors), but cannot be passed further. The tube shows no remains of food on withdrawal. [Patient has been on milk-diet since yesterday.] Larger olive tips on whalebone stem cannot be passed beyond the point mentioned, but one 9.5 mm. in diameter goes through after passing a firm but elastic obstruction behind, at the distance mentioned, measured on the stem. On account of the obstruction and the patient's cachexia no effort was made to test the stomach digestion.

Temperature since admission has been between 97.8° and 99° F.; pulse 90 to 104; respiration 20 to 24.

Urine (sample) turbid with urates, contains no albumin nor albumose, nor sugar; diazo-reaction negative. Sediment negative.

October 24. The patient has had no new symptoms. Has taken in the last twenty-four hours twenty ounces of milk. Weight 108 pounds. Aspirated ascites with small syringe, removing 10 c.cm. of yellow, opaque alkaline fluid. Heat and nitric acid cause a large yellow precipitate. Acetic acid in excess causes a faint increase of the turbidity, and the addition of potassium ferrocyanide throws down a firm coagulum. Fehling's test negative. Solution of caustic soda clears up turbidity slightly, increased by the addition of ether, but ether alone produces no change.

A small sediment obtained by centrifugalization shows numerous round or oval cells two to four times the diameter of a red blood-corpuscle, some much larger, very few small cells, and red blood-cells. The larger cells contain numerous bright granules, and some of them vacuoles, either one or many small ones or one large one, giving the cell a ring shape, with the nucleus more or less compressed.

No tubercle bacilli could be found.

[A guinea-pig inoculated remained free from tuberculosis.]

Blood examination. Blood flows freely, thin and somewhat pale. Red blood-corpuscles 3,230,000. Leucocytes 6200. Hæmoglobin (Gowers) 40 per cent. Differential count (1030 cells): small lymphocytes, 3.8; large lymphocytes and mononuclear, 13.8; multinuclear, 80.5; eosinophile, 0.48; degenerate, 1.1.

Punctured with a trocar above the pubes, removing 4700 c.cm. of fluid. The fluid is bright yellow; opaque; specific gravity 1010; alkaline. Albumin (dry by weight, after coagulating with heat and acetic acid, washing with large quantities of water, alcohol, and ether), 3.8 per cent. Biuret-test, after removal of albumin, negative. Bile coloring-matter test (fuming nitric acid) negative. Fehling's test negative. Diastase test negative. On extracting 100 c.cm. with ether, after the addition of caustic-soda solution, a few small drops of yellow oil are obtained. Prolonged centrifugalization does not clear up the fluid nor produce a fat layer. On standing over night in a 250 c.cm. cylinder a white layer forms 3 mm. thick, which under the microscope shows small oily-looking globules soluble in ether.

The centrifuge brings down numerous cells such as were obtained before. These contain many bright granules and vacuoles of various sizes. Soda solution does not dissolve the granules at once, but after remaining in ether and alcohol half an hour nearly all the granules disappear. Acetic acid clears up the bodies of the cells and makes the nucleus distinct, but does not affect the granules. Iodine solution stains the nuclei and protoplasm as usual, but does not show the

so-called glycogen reaction (either in fresh or dried preparations). Methylene-blue in watery solution added to the fresh sediment stains the nuclei, as in dried preparations.

The cells were spread on cover-glasses, dried in the air and fixed with ether and absolute alcohol, formol vapor and solution, heat, picric acid, and sublimate. Stained in various ways these show variations in size from 6.3 to 30 μ. The smallest, resembling small lymphocytes, are very few. About half the cells are about 15 μ in diameter, and there are many from 20 to 25 μ. Many masses containing three to twenty or more nuclei can be seen, in which neither acids, iodine, nor stains show any separation. The protoplasm is usually pale and granular or vacuolated. The nuclei are relatively large, stain deeply, and show numerous karyokinetic figures. (See figures and explanation in the text.)

27*th*. Urine 380 c.cm.; dark red, clear, no albumin. The foam is yellow. Fuming nitric acid shows bile coloring-matter; there are a few cylindroids.

The patient feels more comfortable. The scleræ and skin show slight icterus. The abdomen is still above the level of the ribs. The superficial veins are plain, but not distended. The abdominal wall is tense. There is resonance in front to the pubes and on the right side, dulness in the left side (on which the patient lies). Palpation negative on ac count of tense wall. Liver-dulness from the sixth to the eighth interspaces in the nipple-line. Œdema in the back as before. The hands were swollen early this morning, but are not now.

At 1 P.M. the patient vomited immediately after eating some bread and milk.

There is diminished resonance in the back below the left scapula, with diminished breath-sounds and vocal fremitus. Aspirated in the ninth interspace at the angle of the scapula, withdrawing 10 c.cm. of clear yellow fluid. This contains cells like those in the peritoneum.

28*th*. Urine 450 c.cm.; specific gravity 1023; dark green with yellow foam; marked bile-color reaction. Sediment contains hyaline casts, sometimes with yellow granules.

The jaundice as before. Liver-dulness from the fifth to the seventh interspace in the nipple-line. Abdomen tense as before. The heart is not displaced. The dulness in the left back as before; the half-moon shaped space is clear. Vomited a little mucus.

November 2. Urine 1100; specific gravity 1023; dark yellow. No albumin nor sugar. Diazo-test positive. Sediment negative. Weight 96 pounds. Patient has not vomited since the 28th. Eats a little bread and milk, corn-bread and beef-broth.

The heart is not displaced. On the left, behind, there is dulness from the fourth dorsal spine, the upper line extending down and toward the front to the ninth interspace in the middle axillary line, where there is tympanitic resonance.

In the right, posteriorly, there is dulness from the ninth spinous process to the seventh interspace in the axilla, sloping down to the liver-dulness in the mammary line. Breath-sounds and fremitus absent over areas of dulness.

Aspirated in the seventh interspace in the left axilla, obtaining 430 c.cm. of dark yellow fluid, specific gravity 1012. The foam is yellow; bile-test positive. Aspirated in the seventh interspace below the right scapula, withdrawing 220 c.cm. of paler yellow fluid, also of

specific gravity 1012. Foam white; bile-test negative. On both sides the lung could be felt as a hard body coming against the needle.

The patient, declining to remain longer in the hospital, passed under the care of my friend, Dr. P. J. Livingstone, of Caro, Mich.

The diagnosis, as given in a clinical lecture, was malignant disease, probably cancer, of the peritoneum, lungs and pleuræ, with growths either in the wall of the stomach, including the cardiac end, or else in the tissues behind it, and pressing on it; also growths pressing on the bile-ducts. The primary seat was left in doubt. The absence of definite symptoms on the part of the stomach, intestines, pancreas, and other abdominal organs made it impossible to assign the primary seat to one of them. The impossibility of examining the stomach-digestion made accurate investigation of that organ impossible. The age made it most probable the disease was primary in the intestine. Primary so-called endothelioma of the peritoneum and pleura was considered, and also a primary growth in the retroperitoneal tissue. Tuberculosis was excluded on account of the low specific gravity of the fluid and the character of the cells. A primary growth of the œsophagus or cardia was excluded.

About a week after leaving the hospital the patient died, and Dr. Livingstone obtained an autopsy. Unfortunately, an accident early in the operation compelled Dr. Livingstone to leave and prevented a complete examination, as also the obtaining of much material. Dr. Livingstone writes that the wall of the stomach was thickened all over and so retracted that its capacity was not more than twelve ounces. The thickness extended to the œsophageal opening, and was especially marked along the greater curvature. Around the cardiac end were large adherent masses of carcinomatous lymph-nodules. The pylorus was almost entirely closed. The omentum was thickened and rolled up. The intestines were involved in a mass of adhesions with the enlarged mesenteric glands. The pancreas was also involved in the new growth. The rectum and bladder were free. The right pleura was adherent to the lower half of the lower lobe of the lung. The latter was of the color and consistence of liver. The pericardium and heart were not affected. The various body-cavities contained, together, five or six quarts of fluid. There was marked jaundice.

Questions in regard to the left pleura and the diaphragm could not be answered. The only tissues saved were a section of the pyloric end of the stomach, the gall-bladder with a bit of liver, and the right kidney and adrenal with peritoneum.

The pylorus has a small ulcer extending into the submucosa. The mucous membrane around the ulcer is thickened and with the submucosa measures 5 mm. in depth. The muscularis is 3 mm. thick. Continuous with this is a firm cancerous mass 1.5 cm. thick. Four cm. from the pylorus the mucosa is 1.5 mm. thick, the submucosa 5 mm., and the muscularis 1–1.5 mm.

The gall-bladder is retracted in all directions, being 2 cm. in diameter in the widest part. The surface is covered with small yellow nodules.

The wall is from 1 to 4 mm. thick. The cavity is filled with thick white mucus. In the wall of the cystic duct, just beyond the gall-bladder, is a soft, white, roundish mass 3 mm. in diameter. Just beyond this is another mass, 1.5 cm. in diameter, obliterating the lumen in that part. Further down is a carcinomatous lymph-nodule, and beside this an infiltration which passes into the liver, with the veins. The peritoneum over the kidney and adrenal is from 2.5 to 5 mm. thick, filled with yellowish nodules or coalescent masses of considerable size.

Microscopical examination. Pylorus: the ulcer mentioned above extends into a scirrhous mass. The remains of the mucosa show for the most part a granulation-tissue filled with large cells with deeply staining irregular nuclei. Tubules are rare. The cells in them usually grow irregularly, filling the lumen. At the bottom of the mucosa are long oval alveoli, lined by irregular cylinder-cells, the deeply staining nuclei of which are toward the walls of the alveoli. A few nuclei show traces of karyokinetic figures. There is no basement-membrane in these alveoli. The walls of the alveoli are made up of connective tissue with few long and narrow nuclei, and are sparsely infiltrated with small round cells. The submucosa contains a few small alveoli lined with polymorphous cells, but for the most part shows an extensive infiltration with shrunken cells in small spaces. In the muscularis are large areas filled with cells which have large, pale vesicular nuclei and very little protoplasm. These spaces sometimes show very thin lines of connective tissue traversing them in various directions, so forming alveoli. Beneath the muscularis are large and small alveoli, the walls of which are of dense connective tissue. They contain atrophic cells.

Near the pylorus the mucosa is still cancerous. The tubules do not show, but are replaced by a granulation-tissue containing epithelial, small, round and multinuclear cells and long spindle-cells. At the bottom of the mucosa are irregular alveoli, lined with irregular or cylindrical cells in a single or double layer, or irregularly filling the lumen. Cells with small nuclei and swollen protoplasm of fine granular or homogeneous appearance are sometimes present in the alveoli. Some of the alveoli are lined by long cylinder cells with small, crescent-shaped nuclei close to the wall. The muscularis mucosæ here contains many alveoli, some of them passing through its whole width, of irregular outline. These are lined with a single layer of cylinder-cells, or more frequently are filled with irregular cells. Just below the muscularis mucosæ are alveoli filled with cells. These have deeply stained nuclei and a large amount of protoplasm, with round or oval outlines. The cells lie close together, so that the boundaries can only be seen by careful illumination and focussing. The cells are retracted from the walls of the alveoli. In some alveoli all the cells have relatively small nuclei and clear, swollen bodies. There are areas of multinuclear cell-infiltration in the submucosa, and extensive large-celled infiltration in the lymph-spaces. The muscular fibres are separated by alveoli filled with epithelial cells, with thin septa in the larger alveoli. There are also a few alveoli lined with a single layer of cylindrical or cubical cells and containing mucus-looking material in the centre. Just beneath the peritoneum are alveoli lined with cubical cells. A few free cells in the alveoli show mucous degeneration. In some the nuclei show evidences of recent cell-division. Furthest away from the pylorus the mucosa shows tubules for the most part of normal appearance, though the cells

are, as a rule, more advanced in mucous degeneration than in a healthy stomach. In a few tubules the cells stain unusually deeply. This is seen especially at the bottoms of the tubules, and in some cases these tubules are prolonged through the muscularis mucosæ. The submucosa and muscularis show cancerous change similar to that in other parts already described.

The wall of the gall-bladder contains numerous small alveoli just beneath the serosa. The large mass described is a carcinomatous focus containing alveoli with very thin septa, and with cells resembling those of the other parts already described. The folds of the mucous membrane of the gall-bladder and cystic duct are filled with cancer alveoli. There are also foci of small-celled infiltration. The cancerous tissue passes into the liver along with the large vessels, and is found, also, in portal areas, some distance from the surface.

The peritoneum over the right kidney and adrenal contains large alveoli filled with the characteristic cells. There is also much small-celled infiltration. The veins of the peritoneum are much distended.

This was evidently a case of cancer of the stomach primarily. That the disease began in the pylorus is impossible to prove, though highly probable. At all events, widespread infiltration or multiple new growths occurred, so that the whole stomach-wall was early involved, followed later by metastasis in the peritoneum and pleuræ.

This view is based on the character of the growths and their distribution. It is hardly necessary to exclude a primary so-called endothelioma of the peritoneum, as the growths here do not go out from the endothelial cells, as in the other disease. The early infiltration of the whole wall gave the local disease the character of a latent cancer, while the affection of the cardia produced the striking symptom of obstruction there.

The case presents two aspects of especial interest: the youth of the patient and the physical and microscopic characteristics of the fluid in the peritoneum and pleuræ.

Age. It is not necessary to speak at length on the first point. Since the publication of Mathieu's[1] classical article, in 1884, it has been admitted more generally than before that cancer of the stomach can occur before the age of forty or even thirty, once looked on as the earliest possible periods. A number of cases have been reported by trustworthy observers. Many are published in so casual a way that enumeration and analysis are out of the question. One fact of importance that seems to be demonstrated by recent observations is that cancer of the stomach in early life often has a slow course. This was brought out when, in the Société médicale des Hôpitaux, March 10, 1895,[2] Mathieu reported the case of a man of twenty-five years, who died of cancer of the stomach, whose symptoms began three years before. Catrin men-

[1] Mathieu, Marc: Du cancer précoce de l'estomac. Paris, 1884.

[2] La Semaine médicale, 1895, p. 225.

tioned another case lasting two or three years. Ferrand spoke of a case with slow development in a young girl, but the diagnosis was not so positively made as in the others. [Puncture of the enlarged liver withdrew a "juice manifestly cancerous."]

The present is the second case of gastric cancer in early life I have seen in which a positive diagnosis was made. In the other case there were classical symptoms in a woman of twenty-four years. A year later my colleague, Dr. B. E. Hadra, operated on account of complete obstruction of the pylorus, and we found the disease (scirrhus) limited to a ring including the pylorus, and only six centimetres wide at the widest part. There was no evidence of cancer in the lymph-nodules removed with the mass.[1] The matter of slow course is important because of the growing and proper tendency to look on cancer of the stomach as a surgical disease. It would be permissible to make a bolder attempt at complete extirpation of all diseased parts in a young person than in the usual subjects of gastric cancer.

It is hardly necessary to speak of the diagnosis of cancer of the stomach in early life, except to repeat the remark of Boas that the diagnosis is difficult because in young subjects cancer of the intestine is more frequent. Of course, in youth, as later, the cancer may be latent, or there may be early involvement of the whole wall, so obscuring the diagnosis or making it difficult.

THE EFFUSION. The transudate in the case now reported belongs to the fatty variety, the peculiarities and causes of which were first accurately shown by Quincke.[2] In the present case the milky appearance was due to fatty degenerated cells and free fat-globules from those cells. As this can occur in conditions so different as tuberculosis and cancer it evidently has only limited diagnostic value.[3]

The low specific gravity of the fluid, as in my case, is usually looked on as characteristic of cancerous as distinguished from tuberculous exudates. The latter are usually of high specific gravity—from 1022 to 1025, in my experience. But sometimes a cancerous effusion has a high specific gravity. In a case of carcinoma of the pleura secondary to one of the stomach, with fatty fluid, Bögehold[4] found the specific gravity of the fluid was 1021 to 1023. [There was considerable free

[1] Since this paper was written I have received the report of the post-mortem examination, confirming the diagnosis made in another case in my clinic, in a woman of twenty-one years. Symptoms were present nine months; tumor was discovered six months before death. Operation was declined. Cancer of the pylorus was found, apparently without metastases.

[2] Ueber fetthaltige Transudate. Hydrops chylosus und Hydrops adiposus. Deutsches Archiv für klin. Med., Bd. 16, p. 121.

[3] As the quantity of fat extracted with ether was so small it is possible the opacity was due in part to some other substance than fat. Rotmann, in a valuable article (Zeitschrift für klin. Med., Band xxxi. p. 438) quotes G. Lion, who found a casein-like substance as the cause of a milky ascites. Hammersten in a similar fluid found a mucoid body.

[4] Berlin. klin. Wochenschrift, 1873, No. 24, p. 347.

blood in this fluid.] Quincke, in two cases of cancerous fatty ascites, also found a specific gravity of 1023. On the other hand, in tuberculous ascites the specific gravity may be as low as 1015. So the specific gravity of effusions must be used with caution in diagnosis.

THE CELLS. For the last fifty years the belief in a characteristic cancer-cell has slowly changed as objective criticism stripped away each attribute thought to be peculiar. At present there is little left but the unfulfilled hope that a cell-parasite may be found, by the recognition of which we may distinguish cancer-cells from others. Peculiarities of form or size, the presence of vacuoles, especially of large vacuoles, fat-granule-cells (especially these last two when in considerable number), cells containing glycogen, have all been abandoned on account of the uncertainty accompanying their application. So careful a clinician as Eichhorst still makes use of some of these things, however. In the latest edition of his *Lehrbuch der klin. Untersuchungsmethoden*, Berlin, 1896, he says, "Especially in cancer of the pleura we find in the exudate, not rarely, abundant fatty-granule cells and cells with multiple nuclei, which are characteristic of cancer." Geigel and Voit speak with more caution, but much to the same effect (*Lehrbuch der klin. Untersuchungsmethoden*, Stuttgart, 1895). But most observers hold that only the recognition of distinct tumor-particles can be used in making a diagnosis of new growth of the serous membranes. The finding of such particles is, of course, not common. It was, therefore, a matter of great interest when Rieder[1] reported a case in which he made a diagnosis of malignant disease of the peritoneum and pleura from finding numerous cells in the exudates showing indirect nuclear division. The patient was a woman of forty years. "Section showed sarcoma (carcinoma?) of the peritoneum, probably secondary to malignant disease of the ovaries." In the fluids obtained during life cells were found which were remarkable "in the first place, on account of the differences in size and shape of the individual cells. Often there were indentations and constrictions, sometimes buddings. In many cells there were one or many vacuoles, often so large that the nucleus was pushed to one side, sometimes hardly visible. The nuclei varied in size and number." The examination of the stained cells showed large numbers of cells showing indirect division, and especially cells with atypical mitoses.

Rieder fully described and accurately figured these cells. His description should be consulted in the original by those interested, being too detailed for quotation here. I have found some interesting forms that he did not, and, on the other hand, he describes some forms I did not get to see. Thus, I did not see such beautiful multilobed cells as he shows, but I seem to have seen more of the atypical mitoses.

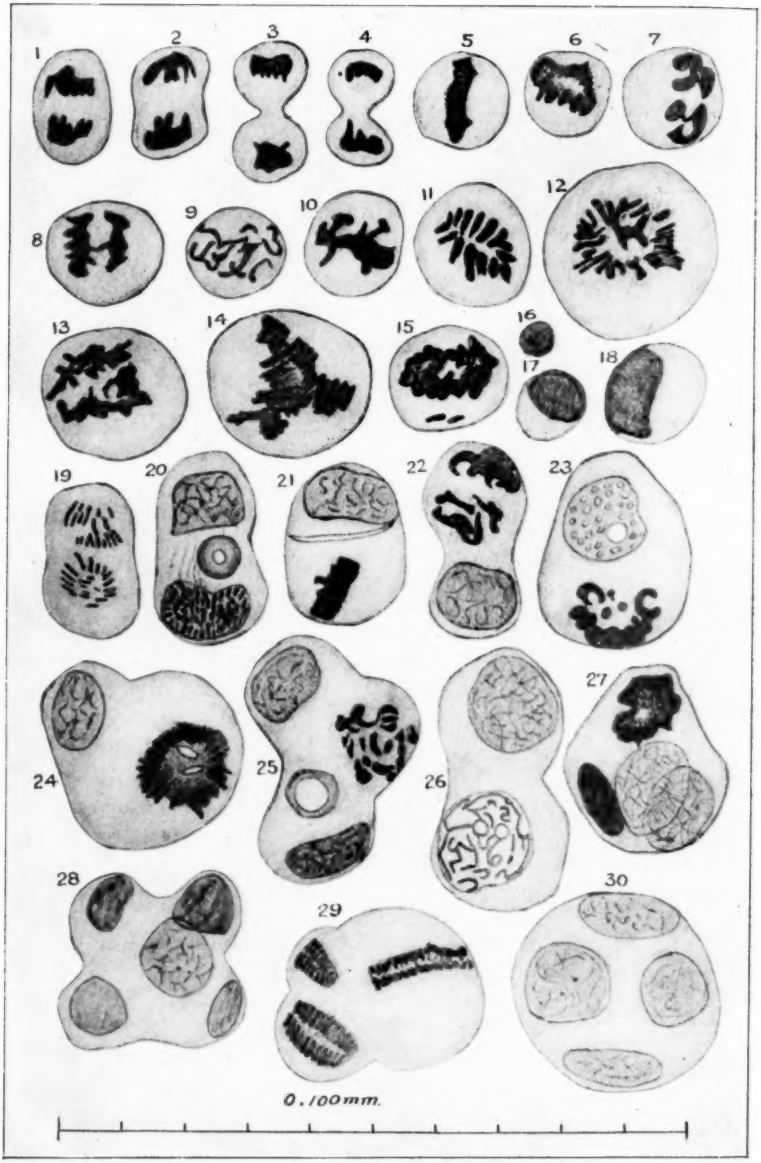
[1] Deutsches Archiv für klin. Med., Bd. liv. H. 6, p. 544.

Incited by the excellent article of Rieder, I began to examine exudates and transudates more carefully than before, but the case now reported was the first one I encountered in which I obtained positive results. Other cases examined in the meantime were non-malignant.

I proceed to a description of the cells. After fixing, the preparations were stained in various ways. The best results were obtained by the use of dilute hematoxylin solutions, especially after hardening in picric acid.

Cells having the size and appearance of lymphocytes are but rarely found (Fig. 16). Multinuclear leucocytes are also very uncommon. The fatty-granule cells that were so numerous in the fresh sediment appear after fixing as in Figs. 17 and 18. In these the nucleus stains with moderate intensity. It is usually finely granular or striated, sometimes shows a fine network, and rarely a nucleolus. The nucleus in these, as in other cells, sometimes contains small vacuoles (Fig. 23). The protoplasm is either finely granular or homogeneous, or, in cells suitably fixed, shows the fatty granules. The protoplasm does not take eosin well; with Ehrlich's neutrophile mixture it shows very fine neutrophile granules thickly filling the cell. [In the figures the protoplasm has been shaded without any attempt at a reproduction of the structure.] The vacuoles show well in stained preparations. They do not give the microchemic reaction for mucin with thionin or hematoxylin. They rarely reach a size larger than 25 μ in diameter, and vacuolated cells such as Quincke and others describe, 100 to 120 μ in diameter, I did not find at all. There are many bodies looking like giant-cells or aggregations of cells. Some are undoubtedly single cells with many nuclei, and I show some of the smaller ones in Figs. 24–30, 43–45. Others contain as many as twenty nuclei, but it is not possible to be certain these are not small cell-nests. However, in the fresh sediment they could not be separated by pressure on the cover-glass, nor could any boundaries be shown by silver nitrate. The latter test, however, on cover-glass preparations is very uncertain. The cells shown in Figs. 21 and 39 show incomplete division of the protoplasm. Occasionally cells showing a similar condition with three or four parts can be found.

The most remarkable feature of the sediment is presented by the great number of karyokinetic figures. These are especially common in cells from 12 to 18 μ in diameter. The protoplasm of these cells is usually more homogeneous than that of others. Vacuoles sometimes occur, and in rare cases the protoplasm may be very much degenerated. Mitoses are so numerous that every field contains one or more. Often two to five can be seen in a small field. Various stages of nuclear and cell division are present. The most common is that of the equatorial plate, as shown in Figs. 5, 6, 11, 15, 21, 27, etc. The spireme (Figs. 9 and 26) and the monaster (Figs. 24 and 44) are uncommon. The meta-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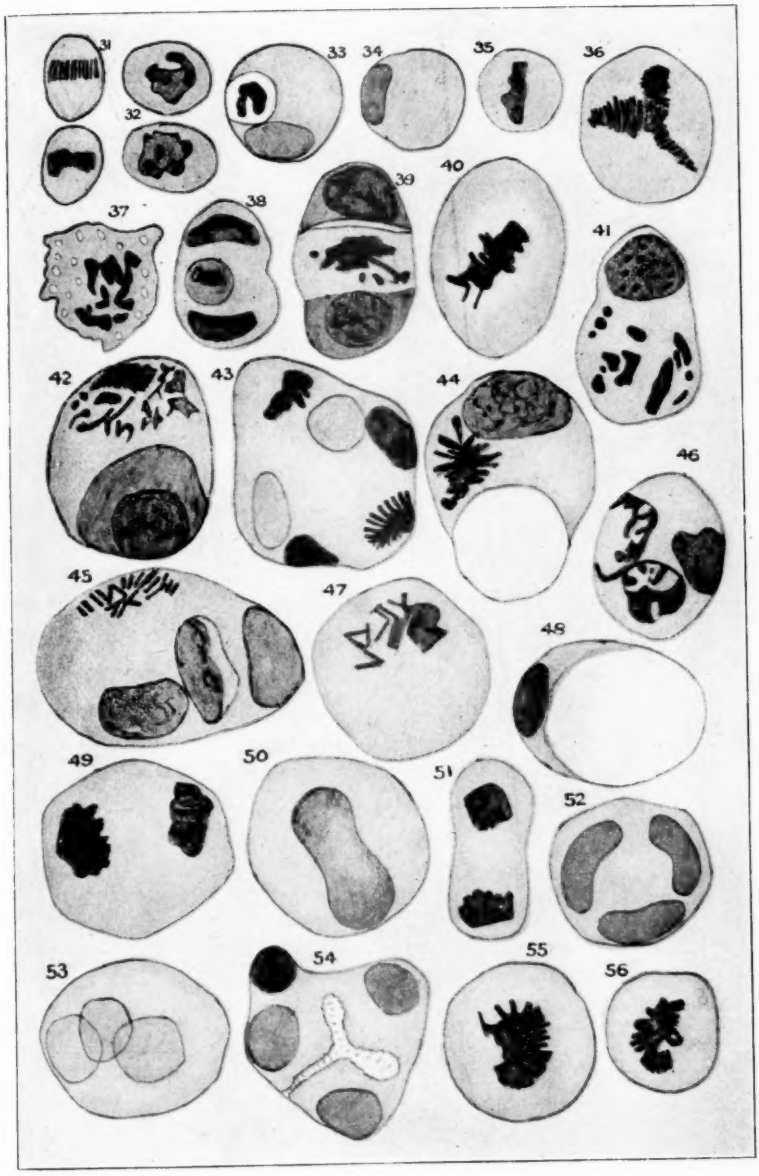
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phase is not so easily recognizable, partly on account of the obscurity of many of the figures, but is well shown in Fig. 29. The anaphase is common, as in Figs. 1–4, 8, etc. The chromatic figures in about half the examples are fairly typical, or show such modifications of size and shape of the chromosomes as can be explained by slight alterations or the mode of preparation of the specimen. Chromatic figures are also found in larger cells, but having the same kind of protoplasm as the smaller one just mentioned, and hence not enlarged as the result of degeneration. These reach a diameter of 28 μ. Cells of all sizes, but especially the larger ones, sometimes show atypical mitoses. Thus, Figs. 14 and 36 show tripolar nuclei. The nuclei in Figs. 12 and 13 may be atypical, but in the absence of polar bodies and achromatic figures they are difficult to interpret.

Cells containing more than one nucleus, and with the nuclei in different stages, are also common. Some of these are shown in Figs. 20–27, 39, 41–45. Many other varieties of these could be given. In these cells one or more of the nuclei are in the resting stage, and one or sometimes more in various stages of indirect division and sometimes showing an atypical figure. The cells in the pleural transudate resemble in all respects those found in the peritoneum, as a few figures will show (Figs. 31–45).

The mitoses found, so far as they can be studied by the chromatin alone, show all the common abnormalities. Thus we find hyper- and hypochromatic nuclei, the latter being rare. Giant mitosis may be represented by the tripolar figure in Fig. 14. Asymmetrical mitosis is not easy to recognize on account of the imperfect preservation of the chromosomes in many cases. The examples of mitosis in multinuclear cells resemble often the figures given by Krompecher.[1]

The finding of the mitotic figures in the ascitic and pleural fluids may be considered from two separate aspects, viz., the great number of these in the first place, and the presence of atypical forms in the other. I shall consider the last first.

The interesting history of atypical mitosis can only be touched on here. Eberth[2] was the first to describe division into four parts, but his statements were at first discredited by Flemming and Strassburger. Later, however, Arnold[3] found multiple karyokinesis in carcinoma. He thought the process might result in the production of polynuclear cells. Since then a great deal of work has been done on the subject, much of it being excited by the ingenious speculations of Hansemann. From an examination of the work done so far it appears that atypical mitoses are found in various pathological conditions, not only in new

[1] Ueber die Mitose mehrkerniger Zellen und die Beziehung zwischen Mitose und Amitose. Arch. für path. Anat., Bd. cxlii. p. 447.

[2] Archiv für path. Anat. und Physiol. Bd. lxvii.

[3] Ibid., Bd. lxxxiii.

growths like cancer and sarcoma, but also in benign tumors and in regenerations; in short, "in all tissues of strong reproductive activity and when there is active mitosis (Ströbe)." They are also found in tissues irritated by various poisons, such as quinine, chloral, nicotine, etc., or in tissues exposed to high temperature (Galeotti). In cancer all observers find them in great richness and variety, but the view that the presence of even a large number of pathological mitoses in a tissue justifies the diagnosis of cancer is gradually being abandoned.[1]

As regards the occurrence and importance of mitotic figures in exudates and transudates, I can find nothing in the literature except the article of Rieder. I have endeavored to control his findings and my own, as far as I was able, by examining other similar fluids in the same way. The results are interesting, but, of course, much more research is still necessary.

I find that in ordinary serous effusions, as in serous pleurisy and tubercular peritonitis, the large majority of cells are multinuclear leucocytes. There are also few or many small cells having the characteristics of lymphocytes, a few larger, mononuclear, cells usually with small vesicular nuclei, and in some cases fibroblasts. My examinations in such fluids, therefore, give the same results as were obtained by E. Grawitz[2] in his investigations on the formed constituents of pleural exudates. Cells like the smaller forms in mitosis in my own case are not found in such exudates. The larger cells in my case do not have their counterparts in ordinary exudates. As I surmised they might be endothelial cells from the peritoneum and pleura, I obtained bits of the former tissue at operations on the abdomen, made cover-glass preparations of scrapings, and examined these after treating them as I had the sediments. In this way, from normal peritoneum and from the apparently normal peritoneum in tuberculosis of that membrane, cells may be obtained which resemble in form, size, and structure of nucleus and protoplasm the larger cells in my case of cancer, but without mitoses. From the inflamed appendix vermiformis I obtained similar cells, also with resting nuclei, but the cells on inflamed surfaces are often smaller than those from similar parts in health. From the normal serosa I obtained cells apparently showing amitotic division. These are more numerous on the inflamed peritoneum or pleura, and I figure one of the

[1] Although I have not thought it necessary to give a detailed review of the subject of atypical mitosis, I should add that a study of the literature will be very helpful to those who wish to make investigations in effusions. As all the literature is quoted in the indispensable works of Hansemann (Arch. für path. Anat., Bd. cxix. p. 299, Bd. cxxiii. p. 356, Bd. cxxix. p. 436; Studien über die Spezificität, den Altruismus und die Anaplasie der Zellen. Berlin, 1893), Ströbe (Beiträge zur path. Anat., Bd. xi., xiv.), Cornil (Journal de l'Anat. et de la Physiol. norm. et path., 1891, t. xxvii. p. 97), and Galeotti (Beiträge zur path. Anat., Bd. xiv., xx.) it is not necessary to give a complete bibliography here.

[2] Charité-Annalen, xviii. Jahr., p. 265.

most striking examples (Fig. 50) from the latter. Several similar specimens, as also some showing later stages, were seen.

In two cases I found cells more like the peculiar forms in my case of cancer.

One of these was a woman of fifty years. A cancerous mamma, with extensive metastases in the axilla, had been removed. A few days after the operation effusions came on in both pleural cavities, with adhesive pericarditis. Femoral phlebitis then developed, apparently from an old leg ulcer, and about two weeks after the operation the patient died. The pleural effusion was examined the second day after it began—*i. e.*, after the disappearance of friction. It was turbid, contained an excess of red blood-cells and lymphocytes, large numbers of multinuclear and a few endothelial cells. The latter showed fatty degeneration, breaking down of the protoplasm, with the formation of small blebs on the edges, and small and large vacuoles. Many of the large cells contained multinuclear cells in vacuoles, a process seen very rarely in the case of McK. (Fig. 33). Some of the larger cells contained two or three or more nuclei in the resting stage. Some of these cells showed partial division of the protoplasm (Fig. 54). Besides these there were a few cells, about two or three in each preparation, showing karyokinesis. These cells are from 20 to 25 μ in diameter, and resemble the larger forms found in the case of McK. The figures are fairly typical, the chromosomes preserved better than in McK. (Figs. 55, 56.)

The body of this patient was examined post mortem by Dr. A. S. Warthin. He found under the pulmonary pleura a few small, puckered nodules. To the naked eye the pleura was intact. Microscopic examination showed these to be small-celled scirrhous foci immediately beneath the pleura, the latter being intact.

In another case pleurisy developed in a young man some weeks after removal of a diseased appendix. Symptoms previous to the appearance of the pleurisy made it seem probable there was a subphrenic abscess, but as the patient left the hospital before death the exact relations could not be made out. The fluid from the pleura was slightly turbid, specific gravity 1024, and gave a growth of streptococci. It contained large numbers of pus-cells and red blood-corpuscles; many small endothelial cells up to 18 μ in diameter, with well-preserved protoplasm; larger cells up to 30 μ in diameter having normal protoplasm; most of these larger cells contain either two or more nuclei in the resting stage (Figs. 52, 53), or a single nucleus in direct division (Fig. 50); a few of the smaller specimens (20 μ in diameter) show karyokinetic figures, but the larger ones (25–30 μ) are found with them more frequently (Figs. 46, 47, 49, 51). Finally, there are cells with the protoplasm occupied by a single large vacuole, the nucleus usually pressed to one side (Fig. 48). These cells measure as much as 55 μ. The nuclear

figures are sometimes difficult to interpret, but, on the whole, are more regular than those of McK.

It seems, then, from the few cases examined, there are more cells showing mitosis in cancerous effusions than in those of simple or tuberculous inflammation. There may also be many atypical mitoses in the former case. The examination of the last case mentioned shows that the differences are quantitative and not qualitative. This is what we should expect from the knowledge we have of karyokinesis, normal and pathological, in tissues. From the results obtained by Rieder and myself it should often be possible to make a diagnosis, especially between cancer and tuberculosis of a serous membrane, by an examination of the cells in effusions. The results in the last case show that all other differences are less reliable than this one. I do not speak of inoculations. Aside from risk of failure, the element of time may be important.

It is interesting to speculate on the origin of the larger cells found. These can hardly be other than endothelial. In Rieder's case and my own such cells are often in mitosis. This would seem to be the result of an irritation of the serous membrane, but an irritation that is not peculiar to malignant new growths, as my last case shows. We cannot, therefore, hope to determine the precise histological character of a growth on such a membrane from isolated cells from it. The fact is interesting in connection with the old view that in cancer of serous membranes the cells of the latter become infected, and so take part in the new growth, an idea of course now abandoned.

In all my cases I have examined the fresh sediment for possible parasites, hoping that a considerable experience with many parasitic protozoa would be of assistance. I could see nothing, however, suggesting such organisms. I looked with especial interest for the *Leydenia gemmipara*, described by Schaudinn in cases of cancerous ascites, but without success. In stained preparations inclusions are not uncommon, but nowhere do they suggest definite forms of parasitic organisms.

Explanation of the figures: All the cells were drawn with the camera lucida, using a Zeiss one-twelfth inch oil-immersion objective, No. 2 eye-piece. The scale is shown on Plate 1 by 0.100 mm. drawn from a standard scale under the same conditions. The outlines of the cells and nuclei are as accurate as possible. Peculiarities of the protoplasm have not been reproduced, in order to avoid confusing the picture.

Figs. 1–30 are from ascitic fluid in the case of McK.; Figs. 31–45 from the pleuræ in the same case. Figs. 46–53 are from pleurisy following appendix operation. Figs. 54–56 are from terminal pleurisy in a case of subpleural carcinoma of very limited extent. Further description of the cells is given in the text.

ADDRESS ON THE UNVEILING OF THE BRONZE STATUE OF THE LATE PROFESSOR SAMUEL DAVID GROSS, IN WASHINGTON, D.C.

By William W. Keen, M.D., LL.D.,
PROFESSOR OF THE PRINCIPLES OF SURGERY AND OF CLINICAL SURGERY IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, PA.

Fellows of the American Surgical Association; Members of the Alumni Association of the Jefferson Medical College, and Friends: Go with me, your spokesman, to-day to the Woodlands Cemetery—that "God's Acre" or "Court of Peace," as the Germans so poetically call it—which holds the dust of so many of the best dead of Philadelphia. Upon an urn there treasured you will read the following:

IN MEMORIAM.

Within this urn lie the ashes of

SAMUEL D. GROSS,

A Master in Surgery.

His life, which neared the extreme limits of the Psalmist, was one unbroken process of laborious years.

He filled chairs in four Medical Colleges, in as many States of the Union, and added lustre to them all.

He recast Surgical Science, as taught in North America, formulated anew its principles, enlarged its domain, added to its art, and imparted fresh impetus to its study.

He composed many Books and among them

A SYSTEM OF SURGERY,

Which is read in different tongues, wherever the Healing Art is practised.

With a great intellect, carefully trained and balanced, he aimed with undivided zeal at the noble end of lessening human suffering and lengthening human life, and so rose to the highest position yet attained in science by any of his countrymen.

Resolute in truth, he had no fear; yet he was both tolerant and charitable.

Living in enlightened fellowship with all laborers in the world of Science, he was greatly honored by the learned in foreign lands, and deeply loved at home.

Behind the Veil of This Life There is a Mystery Which He

Penetrated on the

SIXTH DAY OF MAY, 1884.

HIS MEMORY

Shall exhort and his Example shall encourage and persuade those who come after him to emulate deeds which, great in themselves, were all crowned by the milk-white flower of

A STAINLESS LIFE.

Who and what was the man of whom this is said?

Samuel David Gross was born near Easton, Pennsylvania, July 8, 1805, and died in Philadelphia May 6, 1884, having nearly completed his seventy-ninth year.

His early years, under the wise training of a good mother, to whose memory he rightly pays a just tribute, were spent amid the rustic labors and healthful pleasures of a Pennsylvania farm. This gave him a strong and vigorous body, without which he never could have performed a tithe of the labor which pre-eminently distinguished his long life. Before he was six years old he determined to be a surgeon, and early in his professional studies to be a teacher. Yet when he was fifteen he knew scarcely any English. Brought up among the sturdy, honest, laborious Pennsylvania Dutch, he could speak that curious English-German. But his English, of which he became so fluent a master, and even pure German, which he began to study at the same time, were learned almost as foreign tongues and as a result of his appreciation at that early age of his need for a better and wider education. Even a still more striking evidence of the early development of the innate strength of his character and indomitable will is a story told in his autobiography. While a boy he became expert in playing cards; but finding he was becoming so much fascinated by them that he replayed his games in his dreams, he resolved—fancy this in a boy not yet fourteen!—to abstain from the game for twenty years—a vow he religiously fulfilled.

At seventeen he began the study of medicine as the private pupil of a country practitioner, but after learning some osteology with the aid of that tuppenny little compend, Fyfe's *Anatomy*, and a skeleton, he gave up in despair, for again he found his intellectual tools unequal to his work. The little Latin he had was insufficient, and to understand the technicalities of medicine Greek was a *sine qua non*. "This," he says, "was the turning-point of my life. . . . I had made a great discovery—a knowledge of my ignorance, and with it came a solemn determination to remedy it." Accordingly he stopped at once in his medical career and went to an academy at Wilkes-Barre. He studied especially Latin and Greek, the latter by the use of Schrevelius's lexicon, in which all the definitions were in Latin, and Ross's grammar, constructed on the same principle. But to a master will like his even such obstacles were not insuperable. To Greek and Latin, English and German, later years added also a knowledge of French and Italian.

At nineteen he began the study of medicine again—a study in which for sixty years his labors never for a moment ceased or even relaxed.

In 1828, at the age of twenty-three, he took his degree in the third class which was graduated from the Jefferson Medical College. He opened an office first in Philadelphia, but soon removed to Easton. Nothing is more characteristic of the man than that, while waiting for practice,

he spent hours daily in dissecting in a building he erected at the back of his garden, and provided himself with a subject by driving in a buggy all the way from Easton to Philadelphia and back with a gruesome companion; wrote a work on descriptive anatomy, which, however, he never published, and in eighteen months after graduation had translated and published Bayle and Hollard's *General Anatomy;* Hatin's *Obstetrics;* Hildebrand on *Typhus,* and Tavernier's *Operative Surgery*—works aggregating over eleven hundred pages. His motto was indeed "*Nulla dies sine linea.*" His "stimulus," he himself says, "was his ambition and his poverty."

In 1833, five years after his graduation, he entered upon his career as a teacher—a career which continued for forty-nine years, till within two years of his death. This took him first to Cincinnati as Demonstrator of Anatomy in the Medical College of Ohio. Those of my audience who left Cincinnati yesterday will be amused to learn that by stage, canal, and primitive steamboat it took him thirteen days to reach the Queen City; and all of you will admire the pluck and courage of the young man when I add that his total worldly goods on reaching there were one hundred dollars in his purse, a wife and two children in his family, but also in his breast a heart ready to grapple with any difficulties and determined to conquer them all.

In 1835 he became Professor of Pathological Anatomy in the Cincinnati Medical College, where he was a colleague of Daniel Drake, Willard Parker, and James B. Rogers, one of the famous four brothers, with a second of whom—Robert E.—he was later a colleague in the Jefferson.

His book on the *Bones and Joints* had appeared in 1830, and next, as a result of four years' study and teaching, his *Elements of Pathological Anatomy* was published in 1839. It is strange to think that in a then small Western town in America a young teacher in a new medical school should have published the first book in the English language on Pathological Anatomy. No wonder, then, that it brought him fame and practice; that its second edition made him a member of the Imperial Royal Society in Vienna; and that, thirty years afterward, Virchow, at a dinner he gave to its then distinguished author, should show it as one of the prizes of his library.

In 1840 he went to the University of Louisville as Professor of Surgery, and, excepting one year when he was Professor of Surgery in the University of the City of New York, he remained there for sixteen years, happy in his family, his students, his flowers, and his generous hospitality. He and his colleagues—Drake and Austin Flint—soon made it the most important medical centre in the West, and he was in surgery the reigning sovereign. While there he published, in 1851, his work on the *Urinary Organs,* and in 1854 another pioneer work, that

on *Foreign Bodies in the Air Passages.* His fame had become so great that he was invited to the University of Virginia, the University of Louisiana, the University of Pennsylvania, and other schools. But he was steadfast to Louisville until his beloved Alma Mater called him to the chair just vacated by Mütter. From 1856, when in his Introductory he said, "whatever of life and of health and of strength remain to me, I hereby, in the presence of Almighty God and of this large assemblage dedicate to the cause of my Alma Mater, to the interest of medical science, and to the good of my fellow-creatures," till he resigned his chair in 1882—nay, till his death in 1884—this was absolutely true. Even when the shadows of death were thickening he corrected the proof-sheets of two papers on "Wounds of the Intestines" and "Lacerations Consequent upon Parturition," his last labors in the service of science and humanity.

Three years after he entered upon his duties at the Jefferson he published his splendid *System of Surgery*—a work which, though in many respects its pathology and its practice are now obsolete, is a mine of information, a monument of untiring labor, a text-book worthy of its author, and which has been the companion and guide of many generations of students. It was translated into several foreign tongues and passed through six editions, the last appearing only seventeen months before his death. That even when verging toward fourscore he should have been willing to throw aside all his strong prejudices and accept the then struggling principles and practice of Listerism shows the progressive character of his mind and his remarkable willingness to welcome new truths.

From his removal to Philadelphia till his death, twenty-eight years later, his life can be summed up in a few sentences: daily labor in his profession, editorial labor without cessation for some years in managing the *North American Medico-Chirurgical Review*, the successor of the Louisville *Medical Review*, of which he had also been the editor; article after article in journals; address after address; twenty-six annual courses of lectures on surgery to thousands of students; labors without ceasing till he wrapped the drapery of his couch around him and calmly passed away.

In reviewing his life we may fittingly consider it from the standpoint of the surgeon, the author, the teacher, and the man.

As a surgeon he was painstaking, thorough and careful in his investigation of a case, skilful as an operator, and, having so vast an experience and equally extensive acquaintance with the wide literature of his profession, he was scarcely ever perplexed by the most difficult case and rarely at a loss as to the proper course to pursue in the most unexpected emergencies.

He was a practitioner of the old school, who always mingled medicine

with surgery, and attributed much of his success in the latter to his experience in the former. In theory he sometimes clung to beliefs, which, in practice, he abandoned. In one of his later papers, "A Lost Art," and in his lectures, he still advocated blood-letting; but in the nearly twenty years in which as a student, an assistant in his clinic, and a quiz-master I saw much of his practice, I only remember two cases in which he actually bled his patients.

His influence on the profession was marked and wholesome. For many years he was almost always at the annual meetings of the American Medical Association and the American Surgical Association, was looked up to in both as the Nestor of the profession, and his papers and his wise words of counsel moulded both the thought and the action of his brethren to a notable degree. He founded two medical journals, was the founder of the Pathological Society of Philadelphia and of the Philadelphia Academy of Surgery, the founder and first president of the American Surgical Association, and the first president of the Alumni Association of the Jefferson Medical College. It is peculiarly fitting, therefore, that these last two associations should unite to-day in erecting and unveiling the bronze statue of one who did so much for them and whom they rightly delight to honor. All who knew his tall, manly figure and his fine face will agree that it is a speaking likeness, both in pose and feature. Could I only get a glimpse of the right hand which holds his familiar scalpel I would recognize the man. *Ex pede Herculem! Ex manu Gross!*

As an author, his chief characteristics were untiring industry, comprehensiveness, methodical treatment of his subject, and a singular felicity of style, especially for one who acquired English so late and with difficulty. In fact, through life his speech, by a slight, though not unpleasant accent, always betrayed his German descent.

He "blazed" more than one new "trail" in the forests of surgical ignorance. In the early part, and even in the middle of this century, it was rare for Americans to write medical books. The most they did was either to translate a French or a German work or to annotate an English one. He was one of the earliest to create an American medical literature of importance, and his works on the *Urinary Organs*, on *Foreign Bodies in the Air Passages*, and his text-book on *Surgery* gave a position to American surgery abroad which we can now hardly appreciate; while, as already related, his *Pathological Anatomy* was the very first work in the English language on that most important branch of medicine.

His experiments and monograph on *Wounds of the Intestines* laid the foundation for the later studies of Parkes, Senn, and other American surgeons, and have led to the modern rational and successful treatment of these then so uniformly fatal injuries. He first advocated abdom-

inal section in rupture of the bladder, the use of adhesive plaster in fractures of the legs, amputation in senile gangrene, and the immediate uniting of tendon to tendon when they were divided in an incised wound. Had he lived but a year or two longer bacteriology would have shown him that scrofula was of tubercular origin, and not, as he so firmly believed and vigorously taught, a manifestation of hereditary syphilis.

That his eminence as an author should have met with recognition from scientific organizations and institutions of learning is no cause of surprise. It made him the president of the International Medical Congress of 1876, a member of many of the scientific societies of Europe as well as of America, and won for him the LL.D. of the University of Pennsylvania, and I believe the unique honor in America of having had conferred upon him the highest degree of all three of the leading universities of Great Britain—Oxford, Cambridge, and Edinburgh. Indeed, it is both significant and pathetic to note that he laid down his pen just after recording in his autobiography the announcement of the honor which the University of Edinburgh intended to bestow upon him at its tercentenary celebration.

As a teacher, I can speak both with personal knowledge and enthusiasm. I can see his tall, stately form, his handsome face, his glowing features, his impressive gestures. He was earnestness itself. Filled to overflowing with his subject, his one desire was to impart to us as much of the knowledge he possessed as our young heads could hold. Repetition did not blunt the novelty nor time lessen the attraction of his theme. It always seemed as if he was telling us for the first time the new story of the beneficent work that surgery could do for the injured and the suffering. His whole heart was in his work. Especially did he inculcate the principles of surgery, for he was convinced, and rightly, that one who was thoroughly imbued with these could not go far wrong in his practice.

His own statement of one of the qualifications of a teacher is so true yet so often forgotten that, in spite of its mixed metaphor, I will quote it: "A teacher should be bold and decided in his opinions; not too positive, but sufficiently so to be authoritative. The student cannot judge for himself. The knowledge that is placed before him must be, so to speak, well digested for him; otherwise it will stagger and bewilder, not instruct him." His sense of the heavy responsibility of the teacher is well shown by the following from his autobiography: "Nothing was more offensive to me than applause as I entered the amphitheatre, and I never permitted it after the first lecture. I always said, 'Gentlemen, such a noise is more befitting a theatre or a circus than a temple dedicated not to Æsculapius, but to Almighty God, for the study of disease and accident, and your preparation for the great

duties of your profession. There is something awfully solemn in a profession which deals with life and death, and I desire, at the very threshold of this course of lectures, to impress upon your minds its sacred and responsible character, that you may be induced to make the best possible use of your time and conduct yourselves in a manner worthy of the dignity of Christian gentlemen.' "

The value of recitations in a medical course I fully appreciate and indorse. They will occupy in the future a much larger place in our medical schools than they now do. But I am equally convinced that such a voice, such a presence, such an impressive, earnest lecturer will never lose their powerful influence nor their place in instruction.

As a man, he was beautiful in his relations with his family, who were devoted to him with an affection that was unusually strong; upright in all his dealings, and despising cant and pretence and anything unworthy a true gentleman. Few men were more widely known in and out of the profession, and few ever had the good fortune to know intimately so many distinguished people of both continents. Wherever he was known he was respected, and by those who knew him intimately he was beloved.

Such, then, was the man whom we are gathered to-day to honor. The American Surgical Association, the Alumni Association of the Jefferson Medical College, and a few friends who have gladly united with us in this service of affectionate remembrance, have presented his statue to the people of the United States, to stand forever in our beautiful capital city as a mute yet eloquent evidence of our esteem for his personal worth and his professional attainments.

It is strange that the human race has failed so grievously to recognize publicly its great medical benefactors. Mr. Lecky, in his last remarkable book, in speaking of the rewards of genius in Great Britain, after enumerating the chief of the extraordinary and beneficent achievements of medical men in the present century, says, " England may justly claim a foremost place in this noble work, and many of her finest intellects have been enlisted in its service. In no single instance has this kind of eminence been recognized by a peerage. It is clearly understood that another and a lower dignity is the stamp of honor which the State accords to the very highest eminence in medicine and surgery—as if to show in the clearest light how inferior in its eyes are the professions which do most to mitigate the great sum of human agony to the professions which talk and quarrel and kill." (*Democracy and Liberty*, i. 429.) And yet Jenner almost saved England from extinction, and Simpson and Lister have done far more to mitigate the terrors of surgery and the pangs of maternity, to save life, and to bring health and happiness to the human race than Marlborough and Wellington and Nelson have done to destroy life and bring sorrow and pain and rapine and misery.

It is pleasant to record that England has atoned, with the opening of this year, for such long-continued neglect. In making Sir Joseph Lister the first medical peer she has conferred less honor upon Lord Lister than upon herself.

The statue of Marion Sims, not long since erected in New York, and this one of Samuel D. Gross, let us hope, are the beginning of a similar recognition of beneficent genius in our own land. Go through the broad streets of this beautiful city, and in its circles and parks and squares you will find, with singular exceptions, only the statues of statesmen and warriors—men who deserve, we all agree, their well-won honors and immortality. But, truly, "Peace hath her victories no less renowned than those of war." Though its heroes are not, it may be, portrayed in marble or in bronze, they are enshrined in the grateful hearts of mankind, immortal in literature, even the humblest of such toilers as the Gideon Grays and the Weellum Maclures that cheer and brighten the world.

And were the soldiers, whose statues one may see everywhere around us, the sole possessors of bravery? In 1832, that most dreaded of all scourges, Asiatic cholera, for the first time broke out all over this country with the greatest virulence. Easton was only eighty miles from New York, and the citizens, in terror lest the dread disease would reach their own town, appointed a young, intrepid surgeon to visit New York and learn what he could for their benefit. When others were fleeing in frightened thousands from the pestilence Gross bravely went directly into the very midst of it, reaching New York when the epidemic was at its very height. In that then small and half-depopulated town 385 persons died on the very day of his arrival—and he staid there a week in a hot July, visiting only its hospitals and its charnel-houses. What call you that but the highest type of bravery?—a bravery which Norfolk and Mobile and Memphis have since seen repeated by scores of courageous physicians ready to sacrifice their lives for their fellowmen with no blare of trumpets, no roar of cannon, no cheers of troops, no plaudits of the press! No battlefield ever saw greater heroes; no country braver men!

Yonder statue of Joseph Henry has stood alone for too many years. We have to-day unveiled its worthy companion. Both of them are memorials of men great in science, whose lives were devoted to the good of their fellow-creatures, to saving life, adding to human comfort, lessening pain, promoting knowledge, cheering the sick, and assuaging even the very pangs of the dying. We do well thus to honor in imperishable bronze the men who have won these victories of peace! To no one can the words of the blessed Master apply with greater force than to the kind surgeon whose time and thought and talents are given to humanity, and, above all, to the poor, with no payment but the grate-

ful look of returning health and rescued life and that inward satisfaction which far surpasses all the wealth of the Orient—" Inasmuch as ye have done it unto one of the least of these, my brethren, ye have done it unto Me."

A CONTRIBUTION TO THE SURGERY OF THE KIDNEY AND OF THE URETER.[1]

By Arpad G. Gerster, M.D.,
of New York.

During the period beginning June 21, 1895, and ending February 1, 1897, thirteen patients suffering from various affections of the kidney and of the ureter came under the writer's care at Mount Sinai Hospital.

Ureters.

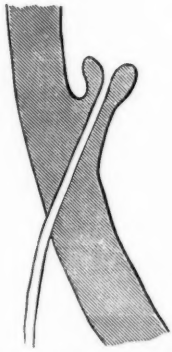
In four cases causative affections of the ureters were observed. In three of them the trouble was relieved permanently by operative procedures which were based upon the labors of Küster, Fenger, and Howard Kelly.

Case I. *Hydronephrosis of traumatic origin; nephrotomy, followed by successful plastic of the proximal orifice of the ureter; cure.*—J. W., aged nine years, a well-developed, but somewhat emaciated boy, had sustained a severe contusion in January, 1895, while coasting on the snow. Hæmaturia followed and persisted for nearly four weeks. Much pain was complained of also, accompanied by considerable fever, which, however, abated by the end of the third week. About six months later a peculiar scoliotic posture was observed in the boy, which was found to be dependent upon the presence of a tumor located in the right hypochondrium. About two quarts of urinous fluid were withdrawn from this tumor, and the following December three pints were again removed. On January 31, 1896, the following conditions were found: in the right hypochondrium, extending well back into the loin, a large fluctuating tumor; the colon could be determined, both by percussion and palpation, situated below and in front of this tumor. The urinary examination yielded a normal result, specific gravity 1020. The liquid obtained by puncture was clear, straw-colored, and charged with urinary contents. On February 3d, chloroform being administered, the tumor was exposed by an oblique lumbar incision, whereupon, the reflection of the peritoneum being found, this was stripped up until the ureter was exposed. Now the sac was freely incised and evacuated. The attenuated substance of the kidney represented in the plane of section a crescent-like mass occupying the upper and posterior part of the periphery of this sac, having in its middle the thickness of about an inch. On the inner surface of this mass unchanged renal papillæ could be

[1] Read before the Society of the Physicians of the German Dispensary, New York, February, 24, 1897.

easily recognized. No sacculation of the calices was present. The proximal orifice of the ureter was very conspicuous, and was found on the anterior wall of the sac about three inches above that part which would be its bottom in the upright posture. It resembled a nipple-shaped elevation projecting about one-third of an inch into the lumen of the sac. (Fig. 1.) The everted mucous membrane of the ureter was

FIG. 1.



Longitudinal section of renal orifice of ureter.

thickened, hyperæmic, and bled on touch. A silver probe was arrested at about the base of this projection, but the resistance yielded to moderate pressure, whereupon an elastic bougie (No. 5, French measure) was readily passed into the bladder. By the time these facts were ascertained the boy's pulse became thready, wherefore, after being plugged, the sac was attached by a few sutures to the integument, and the wound was dressed. The boy rallied promptly on stimulation, and only moderate fever followed. During the first twenty-four hours one and one-half pints of urine were passed by the urethra. Hence, it could be assumed that the left kidney acted in a satisfactory manner.

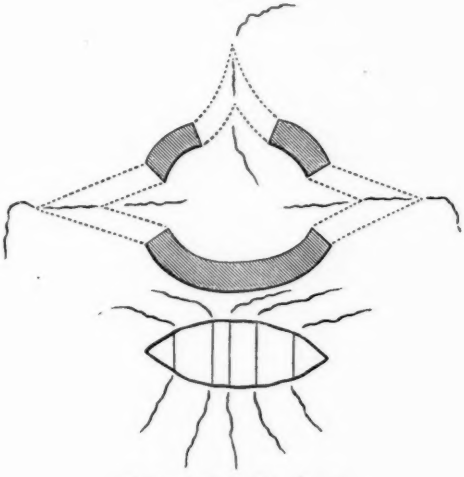
FIG. 2.

Incision of ureteral orifice.

On February 6th chloroform was administered again, and the orifice of the ureter being exposed, the following plastic operation was performed: the everted rim of the orifice of the ureter was incised on the right and on the left side, as well as in the middle of the upper circumference, the incision being carried far enough downward into the ureter to divide the stricture, also, at three points. (Fig. 2.) The upper

and lower angles of each of these rhomboidal wounds were sutured with catgut — *i.e.*, the longitudinal incisions were sutured transversely (Fenger). It became evident now that the lower portion of the projecting rim also needed a plastic correction. Accordingly a flap of mucous membrane one-third of an inch wide and three-quarters of an inch long and distant from the ureter about one-half an inch, was excised from the lining of the sac, the defect being united by five buried catgut sutures. (Fig. 3.)

FIG. 3.



Plastic of renal orifice of ureter.

By this last step the nipple-shaped prominence was converted into a shallow, funnel-shaped depression An elastic catheter having been placed into the ureter, the wound was lightly plugged and dressed. Slight reaction followed, and blood was observed shortly after the operation in the urine voided from the bladder.

On the morning of February 7th the catheter had to be removed from the ureter on account of severe pains radiating toward the bladder and penis. On February 9th the tamponade was renewed. On February 16th the discharge became slightly purulent, with moderate fever. On account of this complication plugging was discontinued, and two stout rubber drainage-tubes were inserted, by means of which the sac was irrigated three times a day with boro-salicylic solution. At the end of each of these irrigations a small quantity of methylene-blue was added to the solution to test the permeability of the ureter. By February 20th methylene-blue staining of the urine voided from the bladder was first observed. There was moderate fever every evening until the end of February. On March 1st the gaping wound was partially closed by means of a number of silkworm-gut stitches passed through the parenchyma of the kidney, leaving an aperture just sufficiently large for the drainage-tubes.

From this time on the boy picked up gradually, leaving the bed on

March 7th, and on March 15th he was sent home to Vermont, with instructions to have the sac irrigated daily. As there was considerable wetting from the renal fistula, a generous moss cushion was applied over the ordinary dressing, by which most of the urine was absorbed.

On April 15th the following report reached me by letter: "There was considerable fever, rising up to 103° F., after the boy's arrival from New York, which, however, abated as soon as the sac was properly irrigated. Thereupon the appetite returned, and the boy commenced to gain flesh and strength. At present there is very little discharge from the drainage-tube. The boy voided about a quart of urine by the bladder, which is acid and contains small quantities of pus."

On May 3d the patient was presented and looked excellently well. I found in the renal fistula a small drainage-tube, the moss cushion nearly dry. The capacity of the sac was ascertained to be one and one-half ounces by measure. Methylene-blue found its way immediately to the bladder. The urine was found to be normal, with the exception of microscopic quantities of pus. I decided to remove the drainage-tube tentatively. By July the fistula was reported closed, and the boy perfectly well.[1]

Case II. *Hydronephrotic floating kidney; nephrectomy; cure.*—Mrs. T. R., aged twenty-five years, nullipara, stated that on December 1, 1896, she began to suffer from paroxysmal pains of the left loin, without a known cause, requiring the administration of morphine. The paroxysms became milder and rarer, but the patient lost flesh, and was distressed by a ceaseless, dull ache, seated in the left loin, and radiating toward the corresponding groin and femur. A few weeks before this a large lumbar swelling was found by Dr. Paul F. Mundé, who sent the patient to me. The tumor was about the size of a child's head, was very movable, smooth, not painful on pressure, and very tense, so that fluctuation became apparent only after puncture, which yielded a clear, colorless serum, with only traces of urinary contents. The patient having been admitted to Mount Sinai Hospital, the daily amount of urine voided by the urethra was ascertained to be about three pints, of normal quality. Hence it was apparent that the other kidney acted properly. The alternative was either to remove the sac or to attempt the restoration of the function of the ureter, which had been lost through a cause as yet to be ascertained. The matter being laid before the patient, she was told that the former procedure would, in all probability, yield a rapid and complete cure, whereas the latter plan was not so certain in its results, and would require prolonged treatment, and possibly repeated operations. The patient declined any experimental measures, insisting upon the summary proceeding. On December 2, 1896, calomel was administered, followed by salts, causing a number of copious evacuations. The next morning the tumor had disappeared, and only when the patient had been anæsthetized with chloroform, on December 4th, could a flabby, ill-defined mass be felt at the site of the tumor. This was displaced well backward toward the loin by pressure exerted by an assistant's hand, and was exposed by the

[1] On March 11, 1897, the patient presented himself with renal fistula reopened. The pelvis held one and one-half ounces of fluid. The colored fluid, however, did not descend promptly to the bladder; hence we concluded that a recontraction of the renal aperture of the ureter had taken place, which will need further correction.

usual oblique incision. It was seen to consist of a much-distended kidney and its pelvis. It was very readily stripped out of its fatty capsule and withdrawn from the cavity, which was a very easy matter on account of the long pedicle. The pedicle being now compressed, the pelvis of the kidney was laid open by an incision carried freely through the attenuated cortex. Within the distended pelvis the entrance to the ureter was easily found, and appeared to be normal. The ureter was patulous throughout. Hence the hydronephrosis was due to obstruction by flexion. The kidney itself presented a characteristic example of what Fenger describes as sacculated cystonephrosis. Each calix was much distended, communicating by a narrow orifice with the pelvis of the kidney, so that the mass really consisted of a number of smaller sacs communicating with the larger cavity of the pelvis. Fenger had succeeded in curing a similar case by operation. He split the kidney in two longitudinally. The profuse hemorrhage proceeding from the large branches of the renal artery running through the septa was controlled by continuous suture. The septa separating the calices from the pelvis were severally divided. In this, our case, the correction of the sacculation would have needed the complement of a repair of the defective ureter—*i.e.*, a portion of its proximal end would have been excised so as to shorten and stretch it, to prevent folding upon itself. Finally, the shortened ureter would have been implanted into the deepest part of the renal pelvis, as was done successfully by Küster. In view of the unwillingness of the patient, we had to abandon this enticing plan, and the kidney was accordingly removed. The ureter and vessels were severally tied with catgut. A drainage-tube was placed into the bottom of the wound, most of which was closed by suture. There was an uneventful recovery, the patient being discharged cured December 30th.

It must be considered a decided advance in the right direction that the cure of hydronephrosis caused by obstructions in the ureter, or the pelvis of the kidney, or the elimination of renal fistulæ, is now attempted in a conservative manner rather than by the sacrifice of the kidney, which procedure begins to appear rather barbaric. However, it must be added that external considerations, as, for instance, the choice of the patient, or a dangerous collapse caused by hemorrhage or heart-failure, may still and will compel the surgeon occasionally to have recourse to the summary process of nephrectomy, which, after all, yields a rapid and certain result. Under circumstances similar to those here related was I compelled to remove an otherwise healthy kidney in February, 1895, at the German Hospital. The case is reported in the *Annals of Surgery* for January, 1896.

Case III. *Empyema of the ureter after nephrectomy; extirpation of the ureter; cure.*—J. K., aged twenty-six years, photographer, sustained during his twelfth year a severe compound injury of the left upper extremity, followed by suppuration and great deformity. In the summer of 1893 nephrotomy was performed on him for pyonephrosis by Dr. Park, in Buffalo, and the kidney being found to be totally disintegrated it was immediately removed. A rebellious fistula persisted, which closed from time to time. Whenever this occurred

symptoms of fever and retention supervened, which abated only after perforation and evacuation of the lumbar abscess. He was admitted to Mount Sinai Hospital in July, 1896. Considerable pyuria and an abscess of the prostate were found. This being incised, the pyuria still continued. Cystoscopy was impossible on account of a tight stricture of the prostatic urethra. In the left loin a very deep sinus was seen passing from the centre of the old scar downward and forward, and discharging from time to time large quantities of pus. No tumor could be felt in the hypochondrium. It was suspected that the discharge might be due to a retained ligature, wherefore the cicatrix was extensively laid open, but no ligature could be found. The large wound was packed, and as the wound was beginning to contract a remarkable variation in the amount of the discharge was observed. Whenever the sinus was discharging copiously the urine became nearly normal, but when the lumbar sinus had contracted large quantities of pus appeared in the urine. This alternation made it evident that the suppuration must be due to a diseased condition of the ureter. The wound in the perineum healed very slowly, closing by the middle of October. On November 13th we proceeded to extirpate the ureter. The most difficult portion of the task was the finding of the renal end of the ureter, which was searched for in a large cicatricial mass closely connected with the peritoneum. I decided not to work at random, but to proceed systematically, my plan being to find the reflection of the peritoneum and to follow this toward the spinal column, gradually raising the peritoneum from the cicatrix until the ureter was found. This plan proved to be successful. An oblique incision following the old scar, and continuing beyond it far enough forward, was passed through the abdominal muscles until the peritoneum was exposed in the anterior angle of the wound. This being stripped up, the posterior aspect of the descending colon became visible. Where the cicatricial mass commenced the peritoneum was dissected up with the knife carefully and slowly, the dissection progressing toward the median line. While thus proceeding, on account of the unyielding cicatricial deposit, the space became somewhat cramped, wherefore a second vertical incision, running parallel and close to the margin of the quadratus muscle, was added. This liberated the tissues to such an extent that the ureter was soon exposed. Its renal orifice was recognized by the everted hyperæmic mucous membrane. From this point on the operation became very easy. The peritoneum was stripped up along the downward course of the ureter. We found Cabot's statement beautifully verified, that on raising the peritoneum the adherent ureter would follow it. The oblique incision was further extended downward, and afterward to Poupart's ligament, care being taken to leave a sufficient muscular mass attached to the rim of the os ilium to enable us to apply an abdominal suture. Successively the psoas major and minor muscles, then the iliac vessels, were exposed, and the ureter was separated from its peritoneal adhesions. The vas deferens could not be seen. The lower portion of the ureter was found to be distended, its diameter being nearly three-fourths of an inch, its lining very tumid and strongly injected. It contained a large quantity of pus, which welled up unexpectedly, flooding the field of operation. Close to the bladder the ureter was found to be very brittle, and a continuous dissection became impossible. On attempting to pass a sound into the

bladder it was found that in close proximity to the lower orifice of the ureter a stricture existed, which, however, permitted the passage of an ordinary silver probe. The ureter was removed close to this stricture, its estimated distance from the bladder being not more than an inch. The wound was now thoroughly cleansed by irrigation, and its middle portion being closed by a dozen stout silkworm-gut button sutures, the upper and lower angles were drained and left open. The procedure had consumed about two hours, and the patient had become very weak. The small and rapid pulse did not respond promptly to energetic stimulation, and the patient's condition remained critical for forty-eight hours. Profuse sweats, continuous vomiting, cold extremities all bode evil, and could not be ascribed to loss of blood, which had been moderate, but had to be rather charged to the extensive stripping up of the peritoneum. Finally the pulse improved, the patient's temperature rising from subnormal to 101° F. Lively suppuration followed from the bottom of the enormous wound, but the drainage was adequate and the abdominal suture healed throughout by first intention. The upper angle healed first. It took about four weeks to bring about closure of the entire wound. To enable us to deal with the patient's cystitis the urethral stricture was gradually dilated, and the bladder frequently irrigated. On January 22, 1897, a cystoscopic examination was made. It was found that the orifice of the right ureter was normal, that of the left ureter being difficult to locate in the mass of hyperæmic ridges of mucous membrane. Gradually the cystitis also yielded, and the patient, formerly suffering from very frequent urination, can at present hold his water for two hours. His general condition has improved wonderfully, and he is still gaining weight. The patient was thereupon presented for inspection.

Pertaining to this subject is the observation that certain forms of pyelitis are maintained by temporary causes, which are very often relieved as soon as the pelvis of the kidney is drained through a direct incision made from the loin. A clot of blood or fibrin, or a calculus, may be the cause of such transient disturbance. In the fall of 1894 I had occasion to test this method of treatment in a case of acute pyelitis with evident retention. After maintaining drainage for about four weeks the febrile symptoms disappeared, and the drainage-tube being withdrawn the wound healed, the patient making a perfect recovery. In the following case, however, the relief was temporary only, lasting so long as the renal fistula was open:

Case IV. *Double pyelitis, with intense cystitis; nephrotomy of the left side; temporary improvement.*—Mrs. G. Z., aged thirty-eight years, multipara, had been suffering for three years with very painful urination. The urine, voided in small quantities, was turbid and very often, toward the end of micturition, tinged with blood. For two months she complained of frequent attacks of lumbar pain. The robust woman was admitted to the hospital March 3, 1896, and her physical condition was found to be otherwise sound. On cystoscopy, according to Kelly's method, the bladder was found to be extremely irritable, its mucous membrane everywhere velvety, bleeding on touch. The trigo-

num, especially, was found to be much injected and intumescent, so that the left ureter could not be found. Catheterism of the right ureter, however, was accomplished, and twenty-eight grammes of a moderately turbid, acid urine were secured, which contained few pus- and blood-corpuscles, specific gravity being 1024. The kidneys could not be felt by palpation, but intense pain was complained of on pressure exerted over the left lumbar region. The patient voided forty-one ounces of urine from the 3d to the 4th of March. Diagnosis was made of double pyelitis, with chronic cystitis. The bladder would not hold more than two and one-half ounces of fluid during deep anæsthesia. On March 26th the left kidney was exposed. The aspirating-needle withdrew from the pelvis about two ounces of slightly turbid urine. Hence it was fair to conclude that it was somewhat distended. Along the aspirating-needle the pelvis of the kidney was freely incised, the incision being carried through the convexity. The surface of the kidney, as well as the parenchyma, appeared normal. Little reaction followed, the frequent urgency to urination becoming decidedly diminished, presumably in proportion to the reduced quantity of urine passing out through the bladder. April 1st cystoscopy was repeated, and the condition of the interior of the bladder was found unchanged. April 21st the patient was discharged at her own request, with the advice to wear a drainage-tube for several months. The disagreeable wetting of her clothing caused by the renal drainage, however, discouraged her so soon that she had the tube withdrawn by the end of May, whereupon the fistula closed within a very short while. There was a strong suspicion of tuberculosis, which, however, could not be confirmed, though frequent search for Koch's bacilli was instituted. Inoculation of a rabbit with the urinary sediment yielded also a negative result.

Echinococcus of the Kidney.

It is well known that the kidney becomes very rarely the seat of hydatids. Statistics show that the left kidney is about twice as often attacked as the right. The literature of the subject, comprising over three hundred recorded cases, contains only one instance of calcification of the sac. In Simon's case (No. 6) partial calcification is mentioned, whereas in this, our case, the entire sac was calcified throughout.

Echinococcus of the right kidney; hydatids voided by the urethra; exposure of the large tumor; incision and evacuation of the contents of the calcareous sac; secondary extirpation of the concremental shell; cure.—Mrs. E. D., aged twenty-six years, was presented by Dr. Steudel, of Seymour, Conn., June 19, 1895. The delicately built, small woman was pregnant in the sixth month, and stated that up to within three months she had felt entirely well, with the exception of a dull and heavy feeling she had observed to exist in the right hypochondrium for about seven years, which, however, had caused her no serious inconvenience. She said that eight years ago, while serving in a place in Germany, she had to feed regularly a number of dogs. A fortnight ago she was attacked by severe renal colic while voiding urine, and she observed that toward the end of micturition a number of grape-like bodies passed away from her. A collection of these bodies was shown to me,

which I immediately recognized as secondary hydatids. Dr. Steudel also found a considerable tumor in the right loin, which on examination was found to be smooth, unusually resistant, non-fluctuating and immovable. It extended downward in the right hypochondrium to the level of the navel, but was not influenced by the respiratory movements. Corresponding to the lowermost portion of the mass a smaller, knob-like, softish projection could be felt, which was very tender on pressure. By percussion it could be ascertained that the tumor extended upward to the level of the seventh rib posteriorly. Moderate nightly elevations of the temperature were observed, on account of which circumstance I advised an operation. Being admitted to the hospital, her daily quantity of urine was found to be 1430 grammes. It contained neither albumin, pus, nor sugar. All other organs were found normal. On June 21st, the patient being chloroformed, the tumor was exposed by an oblique lumbar incision. Now it became evident that the knob-like projection found on the lower circumference of the mass consisted of about two-thirds of the normal kidney, upon the upper pole of which, and connected with it, rested the large ovoid tumor, having the shape and size of a small cocoanut. The attempt to puncture the tumor failed because a stout needle could not be forced into it, breaking off. Finally, with considerable trouble, a square aperture was cut into the bony investment of the tumor by means of a stout resection-knife. Besides a small quantity of turbid serum, the cavity contained nothing but a closely packed, nested mass of hydatid membranes, enclosed in a large outer membrane. All this material being scraped out with a sharp spoon, it was seen that the rough, bone-like shell was bleeding wherever scraped, hence it became clear that it was organized. The oozing was so considerable that it became necessary to plug the cavity and to dress the wound. It may be added that the sharp spoon encountered everywhere the same resistance that an osseous cavity would offer to it. The place of communication between the hydatid cyst and the pelvis of the kidney could not be found.

The operation was borne very well; but in the course of the next week it became more and more evident that the cavity had not the slightest tendency to collapse and to diminish. It was clear that as long as the hard shell remained closure of the wound could not be expected. In Simon's case a number of small, bony plates were expelled, having apparently sloughed away. In this our case, however, we had to deal not with a rudimentary formation of small detached osseous plates, but with a complete bone-like capsule of extremely hard material, which, as we saw later on, varied in thickness from between one-fourth to one-half of an inch, and was well vascularized everywhere. Hence it was not probable that spontaneous expulsion would occur. As it is well known that the outer sac of echinococcus-cysts enters into intimate connections with all the organs of the vicinity, extirpation of the sac is rightly considered one of the most difficult undertakings, and was condemned as improper and inadmissible by Simon. In spite of these considerations the contingencies of the case seemed to

point urgently to the necessity of extirpation, which, with the consent of the patient, I determined to carry out.

On July 15th she was accordingly chloroformed. The operation was an exceedingly difficult, troublesome, and laborious one, both on account of the deep and inaccessible situation of a large part of the osteoid sac, and on account of the serious complications which had to be encountered in the shape of the invasion of both the pleural cavity and the peritoneum. Two of the lower ribs had to be excised, and even then the removal of the closely adherent calcareous masses was very difficult, and blunt dissection inapplicable. The edge of the knife had to be used throughout. When the pleural cavity was widely opened alarming cyanosis and heart-failure set in. The pleural defect was quickly plugged, and artificial respiration was instituted. After about five minutes the patient's condition had improved so far that the operation could be continued. It was found that, just as on the pleural side, so toward the peritoneum the sac had incorporated the serous membrane, and that a large portion of the peritoneum had to be taken away. As soon as the mass was detached from the peritoneum the defect was closed with a catgut suture. The irregular-shaped, calcareous shells composing the entire capsule were of different sizes, the largest one measuring over 7 cm. in both directions; but most of them were much smaller and were connected along irregular lines by short and dense connective tissue, resembling the lines of cranial sutures in an infant's skull. Finally, after about two hours' hard work, all the calcareous masses were removed. The wound was packed and the patient brought to bed. Considerable collapse followed and had to be combated by frequent stimulation, recurring from time to time unexpectedly, so that considerable vigilance had to be exercised. Finally, on the third day, the pulse was steadier and the patient's face lost the pinched look. On July 19th the packings were removed from the main cavity, and it became evident that this had contracted very considerably. The pleural packings were removed on July 21st, and from this date on progress was steady and rapid until the middle of August, when the patient aborted, but this did not retard her recovery long. Her general condition improved steadily, and the large cavity contracted rapidly, so that the patient could be discharged cured, August 22d. Professor Simon mentions explicitly that in his case (No. 6) the extruded plate-like mass contained osseous tissue. In our case Dr. Schwyzer, pathologist of the German Hospital, found only calcareous matter. The remarkable collection of potsherd-like concretions presented vividly recalls the shape of infantile cranial bones. The patient, also presented, is now perfectly well. On palpation the kidney can be felt connected with a resistant mass resting above it, which undoubtedly consists of shrunken cicatricial tissue.

A Plea for an Earlier Performance of Nephrotomy in Acute Inflammatory Conditions of the Kidney.

In the year 1890 a young woman was admitted to Mount Sinai Hospital with rebellious and rather profuse hæmaturia, which was evidently of renal origin. No traumatism, no acute malady had preceded, and the hemorrhage had persisted three weeks before the admission of the

patient, who presented the signs of considerable exsanguination. Her spleen was not enlarged, the quantity of urine normal, its composition altered only inasmuch as it contained a great deal of blood and a few pus-corpuscles, which probably came from the vagina. Every evening slight elevations of the temperature were observed, and the left kidney was rather sensitive both on pressure and spontaneously, and sufficiently enlarged to be felt on palpation. I thought of the possibility of tuberculosis, calculus, or of a neoplasm of the kidney. A number of attempts were made to influence the hemorrhage by internal medication, but were ineffectual. Finally the condition of the woman became so alarming that I decided to explore the kidney. Accordingly nephrotomy was done. It was found that the organ was considerably enlarged and turgid, and that the capsule was extremely tense. The kidney-fat was œdematous. Punctures yielded a negative result. The capsule was incised along the entire convexity, whereupon the parenchyma of the kidney bulged out somewhat. The capsule was strongly adherent, and the surface of the kidney marked by a number of punctate and stellate hemorrhages. By an incision carried through the convexity, the pelvis of the kidney was opened, and, the left index-finger being introduced into it, the entire circumference of the organ was examined bimanually. No stone and no appreciable tumor were found, and the pelvis gave the sensation of a normal mucous membrane. A drainage-tube was introduced, through which large quantities of bloody, urinous serum were discharged. It was noted that the urine voided by the urethra contained much less blood the day after the operation, and in the course of the next ten days the blood-staining of the urine disappeared entirely. The local and general disturbances also disappeared, and a fortnight later the drainage-tube was withdrawn, whereupon the wound healed rapidly. I had occasion to see this patient in the year 1893, when she told me that she had been perfectly well ever since her last illness. According to these facts, tuberculosis, neoplasm, and calculus could be positively excluded, it being evident that we had to deal with a form of acute nephritis accompanied by great tension. The hyperæmia gave rise to capillary hemorrhage, which was relieved by the drainage and relaxation of tension afforded by nephrotomy.

Within the last few years similar experiences have been noted by other surgeons, and finally there appeared in *The Lancet*, in its issue of January 4, 1896, a communication by Reginald Harrison, in which the indication for the performance of nephrotomy is extended to some forms of acute albuminuria which are accompanied by swelling and tension of the kidney. The following lines of thought will appear very natural to the surgeon who is accustomed to see the deleterious influence of great tension and infectious retention on various glandular organs. Every form of glandular inflammation, whether produced by purely chemical or microbial, and through them indirectly also chemical, influences, is accompanied by pronounced disturbances of the circulation, which manifest themselves through the presence of hyperæmia, stasis, exudation, and tension. It is well known how favorably the initial stages of these conditions are influenced by a free incision, which

relieves tension. Especially noticeable is this where glandular tissues are enclosed in a stout capsular envelope, as, for instance, the testicle, the submaxillary and parotid glands. In the case of the testicle and submaxillary salivary gland infection and excessive tension may lead to total necrosis, as can be seen in angina Ludwigii and in cases of so-called spontaneous gangrene of the testis. As far as the final result is concerned, it is not different whether the infection entered through the secretory ducts or through the circulation by embolism.

Very similar must be the conditions in the kidney. Total, embolic necrosis of the kidney, however, is an extremely rare occurrence, there being only one case (Friedlander's) on record. The circumstance is explained by the large size of the renal artery. But the destruction of multiple circumscribed areas of the organ is a common observation. And where the integrity of the kidney is attacked through chemical influences circulating in the blood we see that the secretory apparatus of the organ is primarily attacked. If the invasion is a general one, we see that the disturbance is followed in its highest degrees by marked diminution in the urine, which becomes bloody and charged with albumin, or finally by total and fatal suppression. Very often, in the primarily non-fatal cases, lasting damage is done. The destroyed secretory elements are not only not restored, but their continued disappearance will finally culminate in uræmia. Furthermore, the modifying influence of purely mechanical interference with the normal circulation of the kidney by valvular lesions of the heart, or of a vicarious congestion due to sudden disability of the other kidney, through traumatism, operation, or morbid processes, will also have to be considered. Finally, as before stated, we have to mark the difference between forms of nephritis characterized by rapid and extensive destruction noticeable to the naked eye, and processes of degeneration which affect only the finer structure of the kidney. The questions which present themselves upon the basis of these reflections are: *First*, Will the relief from tension afforded by early nephrotomy and drainage exert a favorable influence upon the initial stages of acute infectious processes of the kidney, which otherwise would lead to suppuration? *Secondly*, Will nephrotomy exert a curative influence if it is performed during the initial hyperæmic stage of certain forms of infectious, non-suppurative nephritis, which have a tendency to lead to ultimate loss of the specific function of the organ, and are not relieved by internal medication?

Before answer is attempted to these questions we have to examine what danger is involved in the performance of the operation of nephrotomy. We know that the relative danger of nephrotomy is directly proportionate with the extent of the renal damage. Tuffier (Duplay et Reclus, *Traité de Chirurgie*, tome vii.) gives a rate of mortality for nephrotomy performed in non-infectious cases of renal calculus of 6

percentum; while in cases of pyonephrosis the rate for the same operation is 23.3 per cent. Other authors have arrived at similar figures. My own statistics, embracing twenty-one nephrotomies, contain only one case of death following this operation, and in this case, as we shall see, the cause of death was really not dependent upon the operation. From this we see, then, that nephrotomy can be considered a comparatively safe operation. As a purely technical problem, nephrotomy is known to every surgeon to be, under ordinary circumstances, a simple and easy procedure. The hemorrhage unavoidably encountered is trifling and easily controlled, and the hemorrhage caused by the incision of the renal tissue itself, though profuse at first, is also easily checked by packing. Should one or more of the larger branches of the renal artery, traversing the septa, be injured, the slight pressure exerted by a good pack will always control the bleeding.

Let us return now to the questions which we have raised. To answer it in a categorical fashion, it is necessary to ascertain the degree of the injury sustained by the renal structures in each given case. The physical and chemical aids at our disposal are extremely valuable and important, but cannot yield the result that is gained from a systematic search made through the parenchyma of the kidney itself by the microscope. I consider Fenger's advice, to avail ourselves of each opportunity afforded by a nephrotomy to remove a segment of the kidney for microscopical examination, extremely useful. No harm is done to the patient, and more definite and precise information is gained regarding the actual condition of the kidney than from the examination of the urine alone, which occasionally leaves us in the lurch altogether. Momentous changes, as, for instance, capillary embolism with consecutive infarction, the presence of pathogenic microbes in the primary urinary channels, desquamative processes, and shrinkage of the glomeruli and canaliculi, can be positively recognized. In case of recovery their former existence cannot be gainsaid. As to the questions themselves, these answers can be given:

First, in all forms of suppurative inflammation of the kidney the surgical principle of early and extensive incision, to relieve tension and to afford drainage, is to be maintained with the same strictness and emphasis as it is accepted for all cases in which the suppurative focus is enclosed in rigid envelopes, capsules, fasciæ, or the periosteum. If a timely incision is not made, increasing tension will inevitably end in the death of the tissues. What we are accustomed to do without hesitation in phlegmonous affections of the subaponeurotic tissues of the palm, in suppurations of the bursæ, of the submaxillary and parotid glands, of the joints, and in acute infectious osteomyelitis—*i.e.*, a free incision, should be done just as unhesitatingly in suppurations of the kidney. The objection that the diagnosis is difficult on account of the deep situation of the organ

is not new. It had to be met, and was swept aside when the pathological conditions just mentioned were clearly recognized. With our ability to diagnosticate deep-seated suppurations at an early stage the hesitation formerly felt has disappeared. It is undoubtedly true that in some of the most destructive invasions of the kidney, as, for instance, in ascending septico-pyelonephritis, or in multiple embolic nephritis, one or another or several of the important physical diagnostic signs may fail. But by skilfully excluding all other organic disturbances, and in the presence of grave and threatening danger from suppression, the surgeon's action will be determined by weighing all the apparent circumstances. One of the most important and reliable signs of a serious involvement of the kidney is local pain on pressure. But even this symptom may be occasionally absent, as will be seen from the case published by Dr. Howard Lilienthal, in *Annals of Surgery*, March, 1896, Case No. 3. The patient in question was operated on in the surgical division of Mount Sinai Hospital. The history is as follows:

Four weeks after an acute osteomyelitis of the upper jaw, treated by extensive incision and the extraction of a sequestrum, the course of healing having been complicated by an attack of erysipelas, suddenly high fever developed with a rigor, accompanied by exquisite lumbar pain of the right side. The urine was normal, except that it contained a trace of albumin, and micturition was painless. Guided by the lumbar pain, Dr. Lilenthal incised, on May 5th, a cortical abscess of the right kidney. The sepsis continuing, another abscess was found on May 20th by an exploring-needle, and was also incised. At this time the urine was still free from pus, containing only a trace of albumin and a few blood-corpuscles, together with a few granular casts. The sepsis still continued, the patient losing ground visibly. He was delirious and somnolent. On July 10th I examined the patient with Dr. Lilienthal. He was extremely emaciated, and presented the features of the gravest septico-pyæmia. A thorough examination of all the internal organs evinced nothing positive. No pain on pressure could be found anywhere. In spite of this, and on account of the absence of other organic changes, I advised a renewed exploration of the right as well as an incision of the left kidney. Accordingly, on July 23d, Dr. Lilienthal incised in both kidneys a number of cortical abscesses. The patient recovered and was discharged cured September 29th.

We had in this instance a very encouraging example of the utility of surgical procedure in a case of multiple embolic suppuration of both kidneys, an affection which heretofore was considered absolutely hopeless. On the other hand, it is very questionable whether the most energetic measures will be of any use where the multiplicity of suppurative foci virtually amounts to a complete destruction of the organ. This condition is comparable to the infiltrating, diffuse phlegmon of a limb, in which the most thoroughgoing and extensive incision cannot lay open every focus of infection, and where the danger to life can be eliminated

only by an ablation of the entire organ. This remark refers to a late stage of the infection. Different, however, is our standpoint when we assume that by an early and extensive incision this very destruction may be prevented. At any rate, it is proper that this interesting and important question be submitted to a thorough test. Assuming that the rapid extension of the destructive process can be modified and checked by an early incision, this procedure assumes a truly conservative value. The rapidity with which the kidney may become compromised can be estimated from the following history:

Chronic cystitis; acute parenchymatous nephritis with miliary abscesses; nephrotomy; nephrectomy; cure.—Mrs. S. S., aged thirty-four years, was admitted December 13, 1896. Had had two children, and stated on admission that she had been suffering from painful micturition for two years. Her strangury was so intense that occasional catheterism was necessary. On December 7th, shortly after a catheterism performed by her family physician, she suddenly felt an intense, cutting pain in her left loin, which was followed by a violent chill and high fever. Each paroxysm was accompanied by retching and vomiting. The lumbar pain was growing steadily worse, radiating toward the bladder and left thigh. On admission a temperature of 104° F. was found. A continuous desire to urinate tormented the patient, even when the bladder was empty. Her pulse was small, very frequent; her integument bathed in perspiration, and in the left loin an exquisitely painful tumor could be felt, which was overlapped by the colon, and was evidently the left kidney. During nine hours which preceded the operation she voided thirteen and one-half ounces of urine, which was alkaline, had a specific gravity of 1022, contained a trace of albumin, a few pus-corpuscles, but no blood. She was chloroformed as soon as I had seen her, and the enlarged kidney was exposed. It was observed that a considerable quantity of watery serum escaped from the fatty envelope of the kidney, which was œdematous. The surface of the kidney appeared to be deeply congested. As soon as the capsule was incised the parenchyma bulged out. When the cortex was incised no blood was seen to flow, but turbid, bloody serum was escaping. Several punctures of the kidney were made, until finally a cavity, evidently the pelvis, was found, from which also a dark-brown bloody serum was withdrawn. Using the needle as a guide, the pelvis of the kidney was freely incised, the incision penetrating from the convexity. While a finger was dilating the deeper part of the incision a resistant band of tissue gave way. This was followed by extremely profuse arterial hemorrhage, which, however, was easily checked by firm plugging with iodoform-gauze. To encourage secretion the kidney was separated everywhere from its fatty envelope, and was surrounded with gauze compresses. Then the wound was dressed.

The only change observed was the disappearance of the acute pain, but retching and the high fever remained, though not so intense as before the operation. When the dressing was changed on December 14th the absence of that copious sero-sanguinolent discharge was noted which is seen regularly to follow nephrotomy. The same observation was made during the following three weeks. Nineteen and one-half ounces of

urine were voided on December 15th. It was alkaline, containing few pus- and blood-corpuscles, a trace of albumin, and had a specific gravity of 1024; strangury unchanged. These observations made it extremely probable, not only that the secretion of the diseased kidney was remarkably scanty, but also that its ureter was occluded. Otherwise much blood would have descended to the bladder. On December 20th the deep packings were removed from the kidney. Renewed arterial hemorrhage compelled us to replace them immediately. Some pus also escaped, but its source could not be ascertained. The quantity of urine passed by the urethra had increased, December 16th, to forty, December 20th, to sixty ounces, and its reaction had become acid. No blood was found in it at any time before January 7th. With continuing fever and vesical pain the condition of the patient became gradually and steadily worse. Several larger and smaller abscesses had broken through into the drainage-channel, and it became evident that the patient would succumb unless the kidney were removed. Accordingly on January 7th this was done. The day preceding the operation sixty-two ounces of urine were voided, hence we concluded that the other kidney was acting in a satisfactory manner.

During the nephrectomy the following facts were observed: the volume of the kidney had shrunk to about the normal standard. Its parenchyma had a waxy pallor. In the lower portion of the kidney an abscess containing about two ounces of pus was found. Separation of the vessels and ureter was very difficult on account of their extreme shortness. One of the ligatures slipped after the kidney was cut away, and the tremendous hemorrhage was controlled by a large clamp. The wound was packed and treated by the open method. The patient bore the operation very well. By January 11th there was a marked diminution of the fever noticeable, and the daily quantity of urine, which had fallen from sixty-two ounces to twenty-six ounces after the operation, arose from twenty-eight ounces on January 11th to seventy-one and one-half ounces on January 12th, which remarkable rise was undoubtedly induced by copious draughts of water. The urine contained much blood the day after the operation. From this day on recovery went on uninterruptedly. The last ligature came away on January 29th, and February 4th the larger part of the wound was closed by secondary suture. At present the patient is expecting her early discharge. It may be added that the strangury ceased immediately after the nephrectomy. The urine is at present acid, abundant, and contains nothing abnormal except a slight trace of albumin. The pathological report on the specimen is as follows:

Diagnosis. Acute parenchymatous nephritis, with embolic abscesses; incipient purulent nephritis.

Glomeruli partly normal, partly atrophic; in the latter case the capsule is filled with granular material; the epithelium congested; the canaliculi show granular degeneration; nuclei do not accept staining. The epithelium is swollen and necrotic; everywhere between the canaliculi round-celled infiltration, without increase of the connective tissue. Vessels appear to be normal, with the exception of the smaller capillaries, which are clogged with a large number of small cocci, probably staphylococcus. The cocci become beautifully visible by staining with Löffler's solution. Inside of the canaliculi there are also groups of short rods, which take the Löffler stain. Everywhere in the cortex are small,

but well-defined agglomerations of degenerated white blood-corpuscles, which can be accepted as miliary abscesses.

Nephrotomy was performed in this case six days after invasion, but the destructive process was not checked by it, nor could the infectious material accumulated in the kidney be drained away in an effectual manner. Had nephrotomy been done twenty-four or forty-eight hours after invasion, would it have been otherwise?

Fulminant and fatal case of double ascending gonorrhœic nephritis deserves to be described here on account of its rarity:

J. J., aged ten years, acquired gonorrhœa while crossing from Europe in the steerage of a transatlantic steamer. The disease became manifest on April 30th, when he arrived. On May 15th difficulty of micturition and fever set in. May 22d—*i. e.*, eight days before his admission to the hospital—violent lumbar pain of both sides was complained of. Three days previous large quantities of pus were voided by the urethra, followed by some blood. After that continuous high fever prevailed; the secretion of urine becoming gradually diminished, and finally scanty. On admission, on the evening of May 30th, the following facts were observed: the patient somewhat cyanosed, somnolent, covered with perspiration; his extremities cold; temperature 101.4° F., pulse 130; copious purulent discharge from the urethra, from which there escaped at short intervals, involuntarily, bloody, turbid urine in small quantities; the urine charged with pus, albumin, and blood; alkaline; its specific gravity 1030. The following morning I found, in addition to the facts just related, both kidneys perceptibly enlarged and palpable, especially so the right one, which was exquisitely painful to touch. The amount of urine voided during the entire night was *eight ounces*. In spite of this desperate condition I determined to incise both kidneys. After the administration of a small quantity of chloroform to produce primary stupor, the right kidney was rapidly exposed. Its fatty capsule was found very œdematous, the kidney itself enormously enlarged and tense. When the cortex was deeply incised there was no hemorrhage. The parenchyma appeared dusky, almost brown, and mottled with a large number of gray spots. It was extremely brittle, discharging turbid, reddish-brown serum. The same kind of serum escaped from the pelvis. A large drainage-tube was slipped into the opened kidney, and the wound was packed. On account of failing pulse incision of the other kidney was desisted from. The patient rallied from the collapse, but his previous condition remained unchanged. The amount of the urine continued to diminish, until the suppression became absolute. The boy died twenty hours after the operation, with a temperature of 105° F. The minutes of the post-mortem examination, made by Dr. Mandelbaum, the pathologist, on June 1st, read as follows:

Both kidneys very much enlarged, especially so the right one, which seemed to be increased to double the normal volume; the left kidney was much congested, containing in its lower portion an abscess which held 4 c.cm. of the pus; the right kidney converted into a mass of innumerable abscesses varying from the miliary to the size of a cherry; capsule strongly adherent; the cortex much thickened. In stripping off the capsule a large number of subcapsular abscesses were exposed; the lower

half of the kidney occupied by a large disintegrating clot; the ureters normal, with the exception of the lower thirds, which are much congested; vesical walls considerably thickened; vesical mucous membrane everywhere hemorrhagic; the prostate much enlarged, strongly congested, and containing a nearly empty abscess-cavity, which still held 2 c.cm. of pus. Slide-preparations of pus gained from the kidneys contained multitudes of staphylococci and gonococci. The blood-serum and serum-agar cultures of the same pus yielded colonies of gonococcus and staphylococcus albus. The pus from the prostate, however, yielded only staphylococcus albus. Cultures made from the urethral discharge remained sterile, probably because they were taken shortly after the escape of some urine. Microscopic sections of both kidneys gave evidence of unmistakable pyelonephritis, and showed luxuriant colonies of gonococcus and staphylococcus by means of Löffler's solution. Gonococci were in every instance decolorized when treated by Gram's stain.

In the presence of such an extraordinary invasion of both kidneys little can be expected from any therapy instituted at a late period of the disease. I wish to emphasize the opinion that when both kidneys are attacked simultaneously in a very virulent manner the indication for energetic action seems to be most urgent, and that much more ought to be done than heretofore in this field, scarcely cultivated by any surgeon. The same indication presented itself in another case during the period of time comprised in this paper, but my urgent wish to interfere was frustrated by the resistance of the patient:

Repeated nephrotomy for pyonephrosis; relapse; nephrectomy; suppression; death.—J. W., aged thirty-five years, had been operated on by me for calculous pyonephrosis in May, 1893, at the German Hospital. Two stones were removed, and the patient was discharged cured. On February 23, 1895, the same operation was performed a second time at Mount Sinai Hospital by Dr. Lilienthal, who also evacuated much pus and removed one stone from the kidney. The patient again recovered, and the wound healed. The patient was readmitted February 24, 1896. He stated that his old pains had recurred in the lumbar region, with high fever, chills, and vomiting. Strangury and augmenting pain drove him to the hospital, where a considerable tumor was found occupying the left loin, with a temperature of 100.6° F., and alkaline urine, which contained much albumin, pus, phosphates, and hyaline casts. The daily quantity of urine was fifty-one ounces. The right kidney could not be felt, nor was deep pressure exerted upon the right loin painful. February 27th the bladder was emptied and irrigated, preparatory to a cystoscopic examination, which, however, could not be carried out on account of the occurrence of a severe chill. March 2d, under chloroform, the old scar being incised, the much-enlarged left kidney was exposed and opened. It consisted of a thin-walled bag, composed of a number of communicating cavities distended by pus, many of these cavities still containing stones. As the organ had become manifestly useless it was immediately removed. Hemorrhage was very moderate, and the patient rallied well from the operation. During the following night very little urine was voided (eleven ounces in sixteen hours), becoming more and more scanty. The patient was apparently failing.

His pulse was very rapid; the temperature 104.6° F.; the skin covered with a clammy perspiration. My proposition to relieve the right kidney by a free incision was firmly declined, and the patient died March 4th in a comatose condition. No post-mortem could be had, but the right kidney was withdrawn through the existing wound, and was found in a state of purulent pyelonephritis, which seems to have existed for some time.

It is proper for me to make this remark that, had I been content with simply incising for a third time the left kidney, the patient's life would have been probably prolonged.

How little can be expected from simple nephrotomy in the presence of a multiple suppuration of the kidney can be seen from the following case:

Tumor of the kidney with pyuria; nephrotomy and evacuation of five renal abscesses, each containing a stone; closure of the wound; recurrence; nephrectomy of the calculous kidney; cure.—Mrs. J. V., aged forty years, multipara, admitted June 8, 1896, stating that she had suffered from persistent hæmaturia five years ago, which, however, ceased spontaneously. A year ago she had sharp renal colic, accompanied by fever and vomiting. Shortly after this pus was detected in the urine. Micturition was never painful. Since four months continuous pyuria and noticeable emaciation existed. Dr. Alfred Meyer found a lumbar tumor, and sent the patient to me. On admission a large, dense, non-fluctuating tumor was found in the right loin, which protruded into the hypochondrium, displacing the colon downward and forward. The urine was abundant, acid, had a specific gravity of 1016, and contained large quantities of pus and some albumin. June 10th, through the cystoscope a normal, pale vesical mucous membrane was seen. Furthermore, it was observed that on gentle massage of the right groin a cylindrical plug of pus escaped from the right ureter, the orifice of which appeared much congested. The left ureter appeared normal. Into this a catheter was introduced by means of Kelly's procedure. Sixteen grammes of urine were collected, that contained a few pus-corpuscles and traces of albumin. Hence it was concluded that the left kidney, though not perfectly sound, was not seriously involved.

June 15th the right kidney was exposed and freely incised. From the pelvis and from four calices large quantities of pus and several irregular shaped uratic stones were removed. The kidney and wound were drained in the usual fashion and dressed. Little reaction followed. The secretion diminished rapidly, and patient was discharged July 18th with a nearly closed wound. Her general condition had improved noticeably. October 7th she presented herself again, reporting that the wound, which had been closed for several weeks, had reopened a week ago, discharging a large quantity of pus. I found the lumbar tumor smaller than it was before the first operation, painless to touch; the general condition of the patient was very good, her urine acid and abundant, but containing much pus. I advised the removal of the kidney, which was done October 22, 1896, without accident. The kidney was found to contain six more abscesses, each harboring a stone. The renal parenchyma looked waxy, and was very much shrunken. By October 27th the urine became nearly normal, though still containing microscopical

quantities of pus. November 20th the mass-ligature of the pedicle came away, and December 15th the patient was discharged, cured.

The presence of morbid changes in the other kidney should not prevent nephrectomy of a totally disorganized organ. On the contrary, the removal of such a pus-bag as was encountered in this case eliminates a continuous menace to the other moderately diseased kidney.

Resembling in many respects the preceding one, the following case was nevertheless much more serious, on account of the extreme marasm caused by a renal suppuration of ten years' standing:

Calculous pyelonephritis of the right side; cystoscopy; nephrectomy; cure.—E. W. A., aged thirty-eight years, merchant, was admitted October 13, 1896, having come from the South. He stated that twelve years ago internal urethrotomy had been performed for rebellious gleet and stricture. This was followed by an acute cystitis, which had persisted ever since that time. He suffered for ten years, more or less, from periodical attacks of severe renal colic of the right side, which were accompanied by chills and bloody urination. In spite of a ravenous appetite the patient had emaciated to a skeleton. Since ten weeks his urine had become putrid, and from that time on continuous fever, frequent chills, night-sweats, and incessant lumbar pain, radiating toward the bladder and the right testicle, were present. Urination was very frequent. The physical examination showed excessive emaciation and light anasarca of the feet; otherwise normal conditions; an accelerated pulse of good quality. In the right loin a large, sensitive, resistant tumor could be felt, which descended to the level of the navel, and extended to the median line. The urine was foul, but acid, containing much pus, some blood, and very large quantities of detritus; its daily quantity was about fifty ounces; the temperature 100.2° F. in the morning, with regular evening exacerbation. October 14th cystoscopy was done. The trigonum was found to be moderately congested, especially around the orifice of the right ureter, from which a solid plug of pus was seen escaping. From the left ureter clear urine was seen escaping at short intervals. Catheterization of this ureter was not attempted. The left kidney could not be palpated. The assumption was fairly justified that the left kidney was sound. October 15, 1896, the patient being chloroformed, the tumor was exposed and easily separated from its lateral adhesions. It represented a thin-walled sac from which the aspirator removed foul pus, and within which a number of stones could be distinctly felt. The cortex appeared waxy. A mass-ligature was placed around the pedicle and the organ was ablated. The wound was dressed in the usual manner. During the first twenty-four hours following the operation fifty ounces of urine were voided, which was nearly clear. It had a high specific gravity, containing a small quantity of pus and a little blood. From October 18th the temperature became normal. The urine continued to be abundant, and the patient's general condition, aided by his enormous appetite, was rapidly improved, so that on November 15th he could return to his home cured, having gained since the operation thirty-four pounds in weight.

Concluding Remarks. The surgical principle, to afford timely relief from tension, and early to evacuate after an early diagnosis, made

in the presence of acute suppurative processes threatening the integrity of an organ, must find unreserved application in suppurations of the kidney. The earlier such measures are taken the more they deserve to be called truly conservative—that is, directed toward the preservation of the functional ability of the viscus. Nephrotomy done in the early stages of renal suppuration is a safe procedure, and ought to be done much oftener than heretofore, the indication being based upon the presence of suppurative fever, a renal tumor, and especially upon the voiding of a decreasing daily quantity of urine.

Secondly. As far as the indication is concerned for the performance of nephrotomy in the presence of acute non-suppurative forms of nephritis, Reginald Harrison strongly recommends early interference whenever, in the presence of an infection, albuminuria and appreciable painful renal intumescence can be demonstrated, from which the presence of increased renal tension can be deduced. He published in the issue of the *Lancet* of January 4, 1896, three successful cases of nephrotomy performed, respectively, in a case of scarlatinal nephritis, in one caused by influenza, and in another one following exposure to weather. These suggestive facts are mentioned here only to serve as a stimulus to further endeavor.

Neoplasms of the Kidney.

During the period comprised within the limits of this paper the kidney was twice successfully removed for neoplasms. Unfortunately in one of the cases relapse followed:

Case I. *Alveolar sarcoma of the right kidney; extirpation; cure; relapse.*—D. G., aged five and a half years, was admitted June 13, 1896, to Mount Sinai Hospital. Her mother stated that the child had commenced to complain of right lumbar pain six weeks before, and that a peculiar hardness could be felt in the loin. No difficulty or pain in urination was observed, but the patient became pallid and lost flesh. On admission a large, smooth tumor could be felt occupying the right loin and hypochondrium, extending downward to the crest of the ilium, and projecting the width of four fingers beyond the median line. It was scarcely movable, and by inflation the colon was found to be displaced far downward and to the left side. The tumor could not be differentiated by percussion from the liver. The urine was absolutely normal, likewise all the other organs. June 19th the patient was chloroformed and the posterior aspect of the tumor was exposed by an incision beginning near the margin of the quadratus lumborum, and extending in an oblique direction downward and forward four inches beyond the median line of the abdomen. The peritoneal cavity was immediately opened and the collapsed intestines were packed away under hot towels. After this my first endeavor was to expose the renal vessels, as from their early occlusion I expected a considerable diminution of the otherwise dangerous and profuse hemorrhage. Accordingly, the peritoneum was stripped up from the kidney until the ureter and renal vessels were exposed. They were cut through between a double

ligature. A large portion of the peritoneum was so closely adherent to the mass that it had to be sacrificed. The most difficult part of the operation consisted in the separation of the upper portions of the mass from the under surface of the liver. A number of large veins communicating with the liver were torn through, and bled profusely. Artery-forceps being inapplicable, the bleeding surface was covered with an iodoform-gauze packing, by which the hemorrhage was perfectly controlled. After the kidney had been removed an appalling cavity lay exposed, in the bottom of which the vena cava could be seen bared to the length of six inches. An affluent vein of the size of a crow-quill had been torn out of the vena cava. The resultant defect was closed by a continuous lateral catgut suture of the vein-wall. While I was rapidly closing the peritoneal defect by a continuous catgut suture, and while the abdominal portion of the external wound was being closed by a number of button sutures, Dr. Lilienthal infused 1000 grammes of normal saline solution, this having become necessary by a threatening collapse. The wound was plugged with absorbent gauze brought out near the posterior angle, and was dressed. The patient was brought to bed with a thready pulse. Repeated attacks of collapse required constant vigilance and renewed energetic stimulation. During this period of depression, lasting until June 21st, the quantity of urine voided was decidedly below the normal, containing albumin, but no blood.

Stools passed involuntarily, and the child's condition remained critical until July 15th. The apathy and depression gradually disappeared. In spite of the extensive abdominal invasion the child took and retained considerable quantities of strongly stimulating liquid food, and to this circumstance is to be ascribed her recovery. The sutured parts healed by the first intention. The large cavity contracted rapidly, and the patient's general condition improved visibly, so that she could be discharged cured September 6th. Unfortunately, a relapse became manifest toward the end of November, when the patient was presented to me with a rapidly growing tumor, occupying the lower surface of the liver. It was inoperable. She died in December. The pathologist reported that the tumor was an alveolar sarcoma.

The removal of this very large and, in its upper circumference, closely adherent tumor became only possible through the adoption of the plan of exposing and securing the renal vessels at the beginning of the operation. The principle of first securing the important vessels holding close relations to a large tumor, before attempting its extirpation, was first promulgated by Langenbeck.

Case II. *Chronic pyelitis; endothelioma of the right, pyelitic kidney; frequent hæmaturia; cystoscopy; extirpation; cure.*—I. D., peddler, aged forty-four years, had been suffering for eight months from frequent exhausting hæmaturia, which had not depended upon any form of traumatism. An operation was proposed to him in October by Dr. Fluhrer, but was declined. On readmission, January 19, 1897, I found in the right loin of the anæmic and somewhat emaciated man a movable nodular tumor, which was not painful to touch, and did not fluctuate. All other organs appeared normal. The urine, voided in sufficient quantity, was acid, had a specific gravity of 1021, and contained much pus, a few

blood-corpuscles, and much detritus imbedded in glairy mucus. The left kidney could not be felt. January 22d cystoscopy was done. The vesical mucous membrane appeared normal. On massage conducted along the course of the right ureter the exit of a cylindrical plug of consistent pus could be observed from the orifice of the right ureter. The left ureter appeared normal, and the escape from it of clear liquid was repeatedly seen. The vermicular material gained from the right ureter came away through a catheter passed after the cystoscopy, and consisted of pus, mucus, and blood. January 26th, the patient being anæsthetized, the diseased kidney was easily removed through the usual oblique incision. The vessels of the pedicle and ureter were separately tied, and most of the wound was closed by suture. The day after the operation the urine showed no traces of pus, but contained a few blood-corpuscles, and was abundant. Healing was uneventful, and the patient was discharged cured, February 28th. The pathologist's report on this specimen was: pronounced alveolar arrangement of the sarcomatous elements, which clearly derived their origin from the endothelium of the smaller bloodvessels of the kidney.

Technical Remarks. Uniform preference was given to an oblique incision beginning from the twelfth rib near the margin of the quadratus and extending downward and forward well into the abdominal wall, the length of the incision depending upon the size of the tumor to be dealt with. Simon's vertical incision yields much less space, and, in the case of large tumors, must be supplemented by one or more transversely placed incisions. Extending the oblique incision well forward has the advantage that the reflection of the peritoneum is readily found, and its accidental injury can be easily avoided. Furthermore, by following the guidance of the peritoneum the ureter is found without difficulty, and a kidney occupying a high position, and hidden by the lower ribs, can be exposed and made accessible without additional resection of the ribs. The renal vessels can also be readily secured, which step commends itself as the initiatory one in the extirpation of large renal tumors. The abdominal muscles should be always reunited in the anterior two-thirds of the wound by button sutures. Where contamination by the accidental escape of pus is not present, and the ureter and vessels were tied separately with catgut, the entire wound can be closed by sutures, with the exception of the posterior angle, which is to be left open for the admission of a large drainage-tube. Should the wound become contaminated by pus, it is safe to employ a thoroughgoing and careful packing of all recesses with absorbent gauze. This can be withdrawn on the fourth or fifth day. Should the wound then be found clean and sweet, the employment of a secondary suture will materially shorten the duration of the healing-process. Should it be necessary to apply a mass-ligature to the pedicle of the kidney, a solid, cylindrical band of rubber, about one-sixth of an inch in diameter, will be found very convenient and safe. It will never

slip, and will cut through much sooner than a silk ligature. Patients should be encouraged to leave the bed as soon as possible.

Statistics.

Plastic of the ureter	1
Extirpation of the ureter	1
Nephrotomy	6
Nephrectomy	7
Of these were cured	10
Improved	1
Died	2

THE RELATIONSHIP OF OTOLOGY TO GENERAL MEDICINE.[1]

By Clarence J. Blake, M.D.,

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Somewhat more than twenty-five years ago one of the first distinctly special practitioners in this country made a statement in open meeting to the effect that general practitioners were to be considered as the rank and file, and specialists as the officers and staff of that army whose business it is to fight, to conquer, and to limit the ravages of disease. It is needless to say that this proposition met with but little favor from his hearers, and, notwithstanding the growth of specialism and the division of the work done by the medical profession into parts, having apparently often but very slight relationship to each other, it would meet with no more favor to-day. At the time when it was first made specialism in medicine was a new, to many a dreaded, and to some an abhorrent thing. The general practice of medicine left the more minute investigation of many organs and their diseases untouched; bacteriology was not, and aseptic surgery had not yet come to point the shorter path to many a long-sought goal and cut the knot of many a medical problem.

With the experience of a quarter of a century, the simile between the medical profession and an army can be only justly used by comparing that army to a brotherhood, the members of which have each and all equal, though different, functions, and if the general practitioner is to be classed with the rank and file, the specialist is to be regarded, not as in any way a superior officer, but as one of that rank and file sent out on special service; for, everywhere, the men who, with the foundation of the general study of medicine, and, still better, in addition, the practical study of general medicine as their base, go forward in any particular

[1] Read at the Congress of American Physicians and Surgeons, Washington, May, 1897.

line of investigation, may be regarded as skirmishers sent in advance, whose duty it is, first of all, to observe, and, secondly, to report back to the main body the result of their observations, and thus to indicate the lines on which the main body may advantageously proceed. It stands to reason, therefore, that the specialist, in whatever line his duty may take him, must be not only an observer, but in some way or other, and to a greater or less degree, a teacher; and the extent to which these functions have been fulfilled, and these relationships of the interdependent parts of the medical community have been developed in the last twenty-five years, it is interesting to observe.

The establishment of the nine special societies which, in addition to the five others of more general purpose, make this august Association, is a striking evidence of the fact that within the period mentioned the growth of scientific medicine and the enlargement of its field of observation have so increased as to make it impossible for any one student to cover completely and adequately the whole ground; and we realize that it is, as always, the study of the infinitely little which establishes the immeasurably great.

Thirty years ago, with few exceptions, there was not a sufficiently large number of medical men engaged in any special branch of research to form a society. The first of the several special societies forming the present Congress of American Physicians and Surgeons was founded in 1864, and the others followed in the order given in the circular of this Congress.

Buried deep beneath the surface, approachable only through a narrow and somewhat tortuous canal, containing within itself an example of almost every histological structure to be found within the human body, the human ear had long been a favorite study of those older anatomists whose minute and painstaking investigations and whose delicacy of research were in keeping with the work of their artist contemporaries. As always, the anatomist lays the foundation-stone; and to Meckel, Valsalva, Eustachius, and Corti we are indebted for that knowledge which has made the study of diseases of the ear, both in itself and in its relation to general medicine, one of the most fascinating of its kind. For not only does the inaccessibility of the organ require, on the one hand, trained manipulation in the surgical treatment of its diseases, but, on the other hand, the reflex relationship of the ear to other organs in the body, its visible and sometimes elucidative participation in other diseases, and its multiple office as an organ of hearing, as a peripheral organ of equilibration, and also as a supplemental organ of space-perception, afford wide opportunities for that theoretical conjecture which is the appetite of research and the stimulus to scientific nutrition.

The mental processes which lead to effective results are always slow and concentrative, and in the brotherhood of scientific research some

one mind advances a little beyond the others; some one thought reaching out seeks the support of facts, and makes suggestions which other minds may slowly follow, and precisely as the study of the structure of the body long preceded the knowledge of its functions, and still further antedated the conclusions drawn from physiological investigation which laid the foundation of the art remedial and curative, so the simple device of a centrally perforated concave mirror enabling the observer to stand behind his reflex light-source lay unnoticed and practically unapplied, until at the end of fifty years it came into use in the hands of the clinician, and revolutionized, or rather, one might properly say, made possible the study of the diseases of the ear in the living subject as they are studied and treated to-day, and the time has now passed when a celebrated aural surgeon saw patients only on bright days, and others used either a concentrating lens or limited their manipulations to parts appreciable by touch.

In 1864, when, in answer to a question from a visiting surgeon, "Why are you going abroad?" a young hospital house-officer replied, "To study diseases of the ear," he was met with this statement, "All that you can do for the ear you can do with a syringe." At that time there were in the United States but four medical men whose knowledge of diseases of the ear went much beyond that indicated by the preceding remark, and these gentlemen were regarded by many in their profession as absurd in their claims as to the possibility of doing anything for ear diseases beyond leaving them to the *vis medicatrix naturæ*, with hope for the best results.

The study of diseases of the eye had at that time taken a recognized place as a branch of surgery and medicine requiring special education and special manipulative skill on the part of its practitioners, and departments in general hospitals, or special hospitals themselves for the treatment of diseases of the eye had already been established in deference to the demands of public need, and were receiving the recognition necessary to their perpetuation in the form of public or private endowment. To these institutions there came, either as the result of a popular appreciation of the need of special treatment, or as the result of a popular association of ideas, patients suffering also from diseases of the ear; for such patients no provision was at first definitely made in the clinics of the general hospitals or the outpatient departments of eye-infirmaries, and they came under the care either of the general surgeon, or were, not uncommonly, transferred by him to the eye-department, as one dealing with a branch of minute if not minor surgery. The aural clinic, without special equipment of its own, came to be, therefore, in the beginning, by force of circumstances, and by lack of knowledge of its possibilities, an appendix to the department or hospital devoted to the treatment of diseases of the eye, and it was not, in this country, until

ophthalmic clinics had already been established, that a definite appointment as aural surgeon was made upon the staff of any of our hospitals, or that any instructor in this branch of medicine was appointed upon a faculty in a medical school. Even then the specialty was slow in making its way to professional and public recognition, and the earlier records of investigation, as shown in medical journals, and the transactions of societies were those rather of physiological investigation and clinical observation than of advance along the lines of surgical procedure in which this specialty has since taken its justly allotted place.

The foundation thus laid, however, was one which, once established, permitted the erection of a superstructure of minute definitions, and the history of the growth of otology as a department of both medicine and surgery may be taken to include the following stages: *First*, the substructure of anatomical investigation, the study of the component parts of the machine, and their assembled relationships to each other; *second*, physiological research, the study of the machine in action, of the purpose of its individual components, and of their effective working relationship; *third*, as an outgrowth of these, the investigations of the pathologist into changes effected by diseases; *fourth*, and based upon these, the work of the clinician with reference to preventable cause and possible repair.

The earlier anatomical works contained elaborate treatises and many accurate illustrations of the anatomy of the organ of hearing, and it is, perhaps, to its concealment within the body, as well as to the entrancing minuteness of its structure, that we owe the interest evoked by it in the earlier students of anatomy, and it is quite understandable that, with but little knowledge of acoustics, the study of an organ so complicated should have led to an intimate investigation of its parts, without the knowledge of their value, at a time when mysticism ruled and the study of the black art constituted it a profession. It is not until the fifteenth century that we find the record of any accurate investigation with regard to that structure, in which Empedocles (400 B. C.) had discovered a snail-shaped body, which he considered as the real organ of hearing. The sixteenth century was especially rich among the Italian anatomists in minute and accurate investigation of this subject. Vesalius described the long process of the malleus, the Eustachian tube, the vestibule, and the semicircular canals. Ingrassia is probably entitled to the honor of the discovery of the stapes. Fallopius described the tympanic cavity, the two fenestræ, and their communication with the vestibule and the cochlea, and the communication of the mastoid cells with the tympanum, and gave his name to the canal through which the facial nerve passes to its point of exit below the ear. Eustachius described the intrinsic muscles, the tensor tympani, and the stapedius, gave a more exact description of that passage leading from the middle

ear to the throat, discovered by Vesalius, but called the Eustachian tube; while Casserius, of Venice, in the closing years of the sixteenth century and the first of the seventeenth, gave a more complete description than had been elsewhere previously published of the sound-transmitting apparatus of the middle ear, and the sound-receiving portion of the labyrinth.

How recent is our more accurate information in regard to the structure of the ear is shown by the fact that in the middle of the eighteenth century the discoverer of the fluid of the labyrinth, Dominic Cotugno, won such a reputation by his work upon the internal ear that he was called to the anatomical chair at Naples; while it was not until a century later, and within the memory of those who hear these words, that the first accurate description of the terminal sound-transmitting apparatus of the human ear was given by the Marchese Corti.

While specialization in medicine is no more definitely marked anywhere than in otology, the investigation into the relation of diseases of the ear to the study of general medicine is one which relieves it from a narrowness of interpretation which would be inevitable were it confined merely to the exhibition of manual skill in the limited surgical field at its disposal. The long training which alone makes the evidence afforded by inspection of the ear valuable, and which, therefore, sets the otologist apart in his field as an observer, brings about the necessity of a relationship between the aurist and his brethren in general practice, and in other fields of special research, which would not pertain were the information which he can afford, as the result of his acquired skill as a diagnostician, more readily within the knowledge of the body of the medical profession as a whole—a relationship which it is needless to say, in addition to subserving a general, beneficent purpose, has its value in the encouragement of that interdependence which is one of the great sources of the strength, as well as of the activity, of the medical profession.

In this sense one of the gifts of otology to general medicine may be said to be the interpretation of hidden things, nowhere more clearly shown than in the diseases of the ear occurring coincidently with the exanthemata of childhood, and in the review of the otological subjects of common interest, which makes the substance of this communication, it may very properly head the list.

That an acute congestion of the tympanic mucous membrane, resulting from closure of the Eustachian tube in the course of an acute coryza, may cause pain, general malaise, rise of temperature, and possibly nausea and vomiting in a young child, and that these symptoms may be relieved by the simple procedure of opening the Eustachian tube, are well known; but that these symptoms without pain, with excessive temperature, and evidences pointing to profound cerebral disturb-

ance, coma, and convulsions, may be due solely to the same cause, and entirely relieved by the same remedies, or by a simple puncture of the drumhead by means of a paracentesis-needle, is not as well known, and it is not until recently that we have come, in the profession as a whole, to realize the full importance of the stand taken by the late Dr. Edward H. Clarke, and quoted with approval by no less an authority than von Troeltsch in these words: "So necessary is a careful attention to the ear during the course of an acute exanthema that every physician who treats such a case without careful attention to the organ of hearing must be denominated an unscrupulous practitioner."[1]

The participation of the ear, also, in diseases of the pleural cavity in childhood, its implication during the process of dentition, and the serious general effect which the disturbance of so vascular and so sensitive a structure in intimate relationship with the brain may have as a complicating factor in some already serious general condition, make the investigation of the ear often a matter of grave importance; while, on the other hand, the demonstration of the fact that the ear is in no way concerned, and that its inspection gives the purely negative evidence of a healthy condition, may often help, by eliminating one possible factor of disorder, to the solution of a complicated problem in diagnosis, for it is especially in children, on account of the intimate reflex relationships of the ear, that that organ comes most frequently into question as a possibly causative or participative agent in other diseases.

"The great vascularity of the canal, the drumhead, and the middle ear in children favors the rapid course of an infective inflammatory process, and, in a child suffering from scarlet fever or measles, with other sufficient cause for rise of temperature and complaint of pain, a discharge from the ear is often, in default of the aural inspection which should be considered imperatively a part of the examination of all such cases, the first evidence of an implication of the ear."

The external auditory canal in the young child is principally cartilaginous, the bony canal, which in the adult forms the inner half, being formed partly by development of the osseous tympanic ring, and partly by the projection of the mastoid cells outward, forming the posterior wall. The facts that deficiency in bony development is not uncommon, and that the vascularity and delicacy of the soft tissues favor inflammatory invasion of the surrounding parts, emphasize the importance of keeping a strict watch upon all cases of diseases of the external and middle ear in children, a not uncommon complication to be borne in mind being the simple post-aural abscess, which, if not speedily treated surgically, results sometimes in extensive denudation of bone, superficial caries, and still more serious consequences.

[1] Perforation of the Membrana Tympani; its Causes and Treatment. AMERICAN JOURNAL OF THE MEDICAL SCIENCES, January, 1858.

The most frequent diseases of the ear in childhood are those occurring in the middle ear, either secondarily as the result of extension of inflammation from the external ear, or from the nasopharynx through the Eustachian tube, the latter by far the more common channel for the invasion of the middle ear, and the primary mechanical cause being usually either the simple congestion and swelling of the mucous membrane of the nose and nasopharynx, such as may occur in the course of an ordinary head-cold, the presence of the so-called adenoid growths in the nasopharynx, or the inflammation of the mucous membrane of this cavity, the Eustachian tube, and middle ear, incident to the course of the exanthemata.

In the first and second instances the middle ear is affected primarily as the result of the closure of the Eustachian tube, either by the swelling of its lining-membrane or by the pressure of the adenoid growth, the results being interference with the ventilation of the ear and with its blood-supply, and a congestion of the middle ear, which in coryza is usually more acute than in the cases where the pressure of the adenoid growth produces a static congestion. In the "earache of childhood," which is most commonly the result of a simple acute inflammation of the middle ear, attention must be directed not only to the organ specially affected, but to the nose and nasopharynx, and to the general condition of the child—a faulty diet, or faulty habits of life being often found to be the predisposing causes; while in the cases of adenoid growths early surgical treatment, thoroughly carried out, is the best remedial measure. One of several objections to the partial and frequently repeated operation without ether for the removal of adenoids is that, while the central growth may be thus disposed of, the region of the Eustachian tube, which needs especially careful manipulation, is left comparatively untouched, and while there may be satisfactory evidence of the establishment of nasal breathing, the passage of air through the Eustachian tubes to the middle ears is hindered by the presence of the remaining lateral portion of the adenoid growth; therefore, with reference to relief of the aural symptoms, the complete operation under anæsthesia, permitting thorough and careful manipulation of the tubal region, is preferable.

In the child the vascular anastomoses are large and numerous, and the divisions of the temporal bone do not assume their relationship of complete ossification until after puberty; the mastoid process, which subsequently forms the posterior wall of the osseous canal, and presents in its interior a mass of diploetic and pneumatic cells, the latter communicating with the middle-ear cavity, is represented in the young child by the mastoid antrum, in direct communication with the middle ear and immediately beneath the thin plate of bone, later known as the tegmen mastoideum, which forms the boundary between this and the cranial

cavity, while the sutura petroso-squamosa permits direct communication, through membranous connections, largely supplied with bloodvessels, between the lining-membrane of the tympanum and the meninges.

The importance of frequent objective examination of the ears during the course, especially in the acute stage, of scarlet fever and measles, is emphasized by the fact already stated, that the middle-ear disease, occurring as a complication of these affections, usually runs a rapidly destructive course, and by the further fact that aural symptoms, other than objective ones, unless unusually severe, are apt to be lost sight of in the consideration of the general condition of the child,[1] while the importance of bacteriological examination is nowhere better illustrated than in the fact that the Klebs-Loeffler bacillus has been found in a discharging ear long after it had ceased to be found in the throat.

Inasmuch as the ear is the channel through which a large part of the educational material is supplied to the brain during adolescence, the importance of testing the hearing and examining the ears of school-children is a subject which should command both the interest and the influence of the profession at large.

Everywhere the doctor, as is incumbent upon him from the high trust which he holds, and in the acknowledgment of the privilege which he has of being a doctor, is called upon more and more to exercise those duties of citizenship which have to deal with the questions of conservation to its greatest usefulness of the one piece of personal property with which each individual in the community is possessed from his birth, and the questions of public hygiene, of the perpetuation of health, and the prevention of disease, of the encouragement of healthy activity, and the utilization, as well as the protection, of the waste humanity which is a public charge, are making justifiably larger and more imperative demands upon the time and thought of the citizen-doctor.

The establishment of medical boards of supervision in public schools is one of the important opportunities afforded the medical specialist, for not only should the children be examined with reference to contagious diseases for the safety of those as yet uncontaminated, but they should be examined also with reference to their ability to avail themselves of the educational opportunities afforded. The truth of this proposition will be best appreciated by those whose study of school-children in respect to defects of sight and hearing will have shown them the unexpectedly large number of such children justly entitled to compensatory advantages.

"The generally received opinion that diminution of hearing in children in consequence of disease is rare, is a mistaken one; indeed, in some

[1] The Relation of an Aural Service to the Needs of a General Hospital for Children. Clarence J. Blake: Medical and Surgical Report of the Children's Hospital, Boston, 1895.

localities the cases of disease of the ear exceed in number the cases of disease of the eye, and, moreover, they are apparently on the increase; the steadily increasing demands upon the mental capacity accompanying the advances of the times bring the defects of hearing more prominently forward, because they show themselves to be a decided hindrance to the better education of the child. The results upon its later mental development of a marked diminution of hearing in a child are, unless compensated for by other instruction, decided and permanent, affecting the understanding, the character, the self-confidence, and, at a later period, the ability of self-support—mental tools, the possession of which is invaluable, and the want of which can never adequately be supplied."[1] In this view it is certainly a matter of importance that more attention should be directed to the detection of partial deafness in school children, in order that proper remedial efforts may be made, or, in default thereof, proper compensatory advantages afforded.

Very nearly 25 per cent. of the patients attending our aural clinics are children under fourteen years of age; of this number 50 per cent. are the subjects of suppurative inflammation of the middle ear, and of this number 10 per cent. or more owe their origin to the exanthemata of childhood, while of the cases of deaf-mutism throughout the United States 27 per cent. have been the result of suppurative middle-ear disease in early childhood, and it is probable that the more thorough investigation, and the systematic examination of the ears of children in our deaf-mute schools, which it is to be hoped will some time be the rule, will show a still larger percentage of these cases.

Indeed, one of the duties of the American Otological Society, as representing to the profession at large its special line of work, is to urge that systematic examination of the ears of children in our deaf-mute institutions, which shall, in addition to throwing the needed light upon the etiology of this deficiency, give the individual opportunities for improvement not otherwise obtainable.

It is equally incumbent upon the members of the Society individually to give to such examinations their personal attention, and to this end the appointment of a competent aurist as a part of the staff of every considerable deaf-mute institution in this country would be an advantage; for, although the proportion of children in such institutions actually suffering from suppurative disease of the middle ear is probably not more than 5 per cent., the number of cases of partial hearing for some portion or other of the musical scale or of a vowel-tone perception is much larger than was formerly supposed, and in the schools in which the articulate method of instruction is pursued the utilization, and

[1] Franciska Schaeling Thorn, 1872. Beiträge zu einer richtigen, leiblichen und geisti Erztehung gehörkranker kinder.

possibly the encouragement, of this tone-perception becomes an important factor not only in the patient's ability to interpret intellectually the substitute for sounds which is presented to him, but puts him on a better plane of communication with his fellowmen, by helping him to achieve a better articulation himself.

The surgery of the ear differs from special surgery of other portions of the body in the important respect of the wide range of manipulative skill required, from an exploratory tympanotomy done under reflected light, through a tube an inch long and less than half an inch in diameter, under the most exacting aseptic precautions, on the one hand, to an operation in a pus-cavity, including the thorough evacuation of the cellular structure of the mastoid process of the temporal bone, with the possible extension of the operative field to the cranial cavity, for the purpose of opening the lateral sinus, or evacuating a brain-abscess, on the other hand, and is certainly a field wide enough to awaken interest and fruitful enough to stimulate endeavor.

The progress which has been made in what may be called the minor operative procedures in ear diseases has come about as the result of a more intimate study of the structure of the ear on the part of the clinician, and a better adaptation of instruments to the end desired; and in this latter respect, as in many others, the aural specialist owes much to suggestions obtained from parallel lines of research, for the instruments necessary for the surgery of the middle ear are quite as delicate as those demanded for operations upon the eye, and the mechanical skill of the dentist has contributed much to the facility with which surgeons now treat diseases of bone.

The complicated construction of the temporal bone, and the number of important structures in contact with, or situated in very close relation to, the cavity of the middle ear, make the minute study of these relationships absolutely necessary as a preliminary to the adequate surgical treatment of its diseases, and what might well be made a text-book on the surgery and the surgical anatomy of the temporal bone yet remains to be written. Given in the adult a suppurative process in that bony cavity known as the tympanum, bounded by its outer wall of membrane which has been already punctured for the liberation of the contained and rapidly secreting pus, we have a possibility of the extension of the inflammatory process from the middle ear into the cavity of the mastoid bone, and thence of the passage of pus through some thin point in the wall of the mastoid cavity downward into the tissues of the neck, or inward into the cranial cavity, and there may be as the ultimate result of an inflammation starting in a cavity less than half an inch in its longest, and not more than a thirty-second of an inch in its shortest, diameter, a meningitis, a thrombosis of the lateral sinus, or an abscess of the brain. Professor Politzer, in one of his courses of lectures, was accustomed,

holding a temporal bone by its styloid process, and turning it slowly before the class, to say, "Gentlemen, the temporal bone has four sides, the outside is bounded by life, from which there comes through the opening of the external auditory canal one form of our appreciation of what life means; on the other three sides this bone is bounded by death." Dramatic as this statement was, it had the desired effect of a text in fixing the attention of the student, and it had, moreover, the merit of being, on further consideration and with a deeper knowledge of the subject, strictly true; for it is only necessary to place side by side the earlier records of autopsies which revealed an abscess of the brain, and the records of any considerable aural clinic to-day, with its list of successful operations upon the mastoid, the lateral sinus, and the brain, and to read the growing literature on the subject of otitic brain-abscess, to realize the gift in this respect of aural surgery to the profession, and the reason which the general surgeon has for respecting this special field, a gift which is, however, no more than an acknowledgment of favors received, for the whole success of the specialist in the surgery of the temporal bone is the fruit of the application of broad general surgical rules, together with special anatomical knowledge, to the solution of the critical problem; while the surgery of the middle ear in cases of suppurative disease is again that application of general surgical rules reduced to the dimensions of the cavity with which it has to deal.

The surgery of a suppurative process within the temporal bone which, beginning in the middle ear, has implicated the mastoid process and threatens contiguous structures, has to take into consideration, not merely the effort to save life, but also to conserve, so far as may be possible, the hearing-power, and to leave undisturbed the equilibrating function of the ear; but it has also to take into consideration the possibility of injury to important structures lying in minutely close relationship to the necessary operative field.

Under these circumstances it is a tenable proposition that no aural surgeon should undertake an operation upon the mastoid in a case of suppurative implication of that cavity without being prepared by his mental and material equipment to enlarge his operative field to any extent demanded, or without having, if he does not possess it himself, the necessary surgical assistance and counsel at hand.

The fact that it is easier for the aurist to learn to open the cranial cavity, and to operate upon the lateral sinus or the brain, than for the general surgeon to acquaint himself with the technical procedures of operation within the temporal bone and middle ear, is an argument in favor of leaving the subject of the intracranial complications of suppurative middle-ear disease where it now largely stands, in the hands of the special practitioner.

Of the diseases of the ear which come under the consideration of the

general practitioner, and which do not menace life, the first in the list is the so-called chronic catarrhal inflammation of the middle ear, which makes in the temperate zone about 30 per cent. of all the material ultimately referred to the aural specialist. Under the broad title of chronic non-suppurative diseases of the middle ear there lie hidden a series of changes in the soft tissues of the sound-transmitting apparatus which are still the subject of interested study and investigation; and one of the many fields of research open to the student of the future in otology is the further acquired differentiation of those alterations in structure, the result of disease, which interfere with the transmission of sound, and the etiology of which is often to be traced to a remote source. As an example of this may be taken the peculiar, and often puzzling, cases of variable hearing occurring in young women, who ultimately become very deaf to all sounds aërially conveyed. The great variations, occurring as they do, in girls soon after puberty, or in young women who were the subjects of considerable nervous and emotional strain, led, without other ascertainable cause, to the conclusion that these variations were purely of neural origin, and being merely symptomatic were to be disregarded or to be dealt with solely through attention to the general condition. A special study of these cases, however, through the aural speculum, showed, under conditions of the greatest hearing-impairment in many of them, a localized congestion of the tympanic mucous membrane, especially of the niche of the oval window around the stapes. This peculiar blush was found most commonly, periodically, in connection with the disturbance of the menstrual functions, or with other evidences of pelvic disorder, and, with the assistance of the gynecologist, it was found in the great majority of cases that there was either malposition of the uterus, erosion of its neck, or atresia of its cervical canal, and that the remedying of these defects had a very material and beneficial influence upon the localized circulatory disturbance and accompanying tissue-change in so important a portion of the middle ear as is the inner end of the sound-transmitting chain of bones.

Another example of the interdependence of the aurist and the general practitioner is shown in the cases of chronic non-suppurative middle-ear disease in which the deleterious changes in the lining-membrane of the tympanic cavity are furthered by general nervous overstrain, overtire, and the coincident train of disturbances of nutrition. In these cases the local treatment of the ear is futile, or of but little and temporary benefit without careful attention given to general hygiene and to a consideration of the condition of environment of the patient, climatic or otherwise. The dependence upon local treatment alone in such cases is sometimes mischievous in its results, and at least fails of the benefit which might accrue from a broader view of the situation, and

emphasizes the importance of a consultation between the aurist and physician, who, as the family adviser, has cognizance of conditions which may have an important bearing upon the etiology and progress of the case in question.

The first tendency in specialism is to lay stress upon the special character of the investigation to be followed, and to emphasize its individuality; but, with the broadening of the study, its relation to and dependence upon general scientific research become more and more evident. Specialized specialism ceases to exist in proportion as it separates itself, and grows and broadens only as it keeps up its relationship with the main body; and here again the military simile may be employed, for the specialist, who, as a skirmisher exploring an unknown country, cuts himself off from the main body which is his support and to which he owes his allegiance, and who seeks to exist to himself alone, fails of that usefulness in the line of duty which is the invariable price of any existence whatever.

One of the most striking examples of elucidative work in otology is that which has had to do with the definition and explanation of the curious complex of symptoms of which vertigo is the most marked and incapacitating manifestation.

With the recognition of the ear as a peripheral organ of equilibration, and with increased knowledge of its reflex relationship to the sympathetic nervous system, the better definition of its blood-supply, and the differentiation of its vasomotor tracts, came an explanation of much that had been vague and mystifying in those cases of vertigo of sudden onset which had formerly been referred either to abnormalities in the circulation of the brain, or to disturbances of the digestive apparatus, as their amenable cause; and the advances made in the study of the physiology of the sound-transmitting apparatus and in the application of surgical rules to the treatment of diseases of the middle ear have brought to our knowledge the positive advantage of establishing still another differentiation, that of *aural* as distinguished from *auditory* vertigo.

It is now a recognized fact that an effusion or hemorrhage occurring in the labyrinth may affect the hearing or the balancing power, or both, of the individual to a greater or less degree, according to its location and extent, and that the symptoms, so far as equilibration is concerned, may gradually disappear, to be reawakened at a later period by general conditions which induce a suspense of vasomotor inhibition, and thereby a secondary irritation of the terminal nerve-apparatus. It is further established that a fixation of the sound-transmitting apparatus of the middle ear, by doing away with or decreasing the function of one of the outlets from the labyrinth for pressure exerted by dilatation of the intralabyrinthine vessels, favors disturbance of the nervous end-appa-

ratus by a less degree of circulatory pressure than would be possible were the elasticity of the membranes of the round and oval windows and the mobility of the ossicular chain unimpaired.

The records of aural clinics show an increasing observation of cases of suppurative disease of the middle ear in which pressure upon the stapes as the result of a new growth or of epidermal exfoliation causes a series of symptoms very closely resembling those of the so-called Ménière's complex, and in which vertigo plays a prominent and disturbing part. These cases are almost invariably relieved by the removal of the morbid growths or accumulations, and the consequent release of the labyrinth from extrinsic mechanical pressure, and constitute the class of what may be called the mechanical or aural vertigoes. For purposes of distinction the first series of cases just cited may be termed auditory or labyrinthine vertigo, and the second class may be considered as lying between these two extremes. Beyond this grosser differentiation it is possible to go into minute definitions as to immediate or reflex cause and effect, and to follow the subject into the domain of the neurologist, before it shall in any degree have received the attention in investigation which its importance demands; while the question of intralabyrinthine lesions as an accompaniment of diseases of the kidneys, of the digestive apparatus, of the pelvic organs in women, and of the constitutional diseases of which syphilis stands at the head of the list in the number of cases of labyrinth-implication, and of diseases of the internal ear in children, present problems toward the solution of which the general practitioner and the otologist may well take counsel together.

There is one other subject which should command the attention both of the aurist and the general practitioner, and that is what may be called the "fatigue of deafness," a common and often unestimated factor in the causation and persistence of neurasthenia, and one imposing upon sometimes feeble shoulders a burden which it becomes us to lighten, if we cannot lift.

It may be taken as an accepted fact, among other evidences of the bounty of nature as set forth in the construction of this temple of the body, that those of us who have normal ears start in life with double the amount of hearing absolutely necessary for the ordinary purposes of social communion, and it is therefore possible to lose one-half of one's hearing-power before becoming conscious of the loss. Under these conditions, where the daily ordinary use of the hearing is regarded as the standard of perfection, it is easily understandable that a chronic progressive disease impairing the hearing may become fairly established before attention is turned to the necessity for interference, with a view to prevention and repair, and it is therefore not unusual to find in the majority of the chronic progressive diseases of which the slow impairment of hearing is the important symptom, that they have by the time they come into the

hands of the aurist long passed the possibility of prevention, and have established a condition which can be in only a moderate degree repaired. The apparent hopelessness of many of these cases, the impossibility of effecting by the treatment more than a slight improvement, should be no deterrent to the honest and strenuous effort to ameliorate the condition of cases of this class, and it is in many of them that the general practitioner, the family physician, and the specialist can best work hand-in-hand, for the deleteriously causative and influencing factors in the general condition in these cases are so many, and the progress toward improvement so slow, that the local treatment may often be advisedly limited to that which the patient can himself effect under the observation of his physician, with occasional examination and suggestion from the specialist; and there is probably no class of cases, although coming under the care of the aurist, which is so likely to become the subject of what may be termed over-treatment, either surgical or medical, as the chronic non suppurative diseases of the middle ear. It is especially in connection with these cases of slowly progressive impairment of hearing that the fatigue of deafness manifests itself. Few intelligent observers outside of the very deaf themselves, or of those who have to deal much with persons so afflicted, can appreciate the profound exhaustion resulting from the effort to compensate for a deficiency in this particular line of communication with the outer world in the person whose perception of that mode of motion to which we give the name of sound was once made without appreciable effort, and who has, under conditions of impaired hearing, first of all to make an effort to hear, and, in default of hearing, an effort to appreciate vocal utterance by watching the motion of the lips of the speaker; and finally, in default, either through lack of perceptive power or through ability only to catch consonant sounds which are formed in front of the mouth, to solve the puzzle of the spoken sentence by filling in the missing consonant sounds, those imperfectly heard or inadequately seen, from the appreciated context of the sentence; so that where once understanding came without effort, three distinct and appreciable brain-efforts are required: the first, to hear; the second, to see; and the third, to understand. In our estimate of the burdens of life, the consideration of which belongs especially to the ministry of the medical profession, we should, I think, all of us endeavor to estimate more justly as scientific observers, more kindly, perhaps, as fellow-creatures, the nervous strain, the restrictive limit to useful expenditure of energy, and the demand for compensatory consideration for the pitiably deaf.

It has been impossible within the compass of this address to do more than touch upon some of the points which make the relationship of otology to general medicine—a relationship which it becomes the practitioners of both to conserve and strengthen, with the purpose of keeping

the specialist from becoming narrow, and of giving the general practitioner opportunities for gaining something more than a superficial knowledge of this special line of work.

To this end the further establishment of obligatory courses in the medical schools, with clinical lectures and instruction in methods of diagnosis and treatment, with clinical conferences and a practical examination of the student at the close of the course, are among the suggestions to be made; while for the graduate student in this country, as is now the case abroad, systematic courses, including opportunities for the study of the structure and development of the ear, its anatomy, its bacteriology, and the pathology of its diseases, in addition to clinical instruction, should be afforded.

The experience of teachers in this department of medical instruction shows that more time is required to give a student the knowledge of diagnosis adequate to his future uses as a general practitioner than is required in almost any other branch of special medical study.

The inaccessibility of the deeper and more vulnerable parts of the ear, and the minuteness of the objective field, with the changes in the diagnostic picture presented during the ordinary course of any of the more important diseases, and the variations incident to complications which may occur, make accurate determination of the true condition, except to the trained observer, often a matter of great difficulty.

The inducement which led the medical student of thirty years ago to take up the study of diseases of the ear, because it presented a promising domain for original research, is as true to-day, with its widened horizon, as it was then, and grows with the growing appreciation on the part of the otologist that his study, in its demand for better preliminary education in acoustics, better knowledge of pathology, with its suggestions for future use, better knowledge of bacteriology in its relation to diseases of the ear, and better knowledge of the general diseases in which the ear may be implicated, is one which affords such great opportunities for scientific investigation and helpful usefulness as to make it worthy of the earnest and unwearying devotion of a lifetime.

REVIEWS.

A System of Practical Medicine by American Authors. Edited by Alfred Lee Loomis, M.D., LL.D., late Professor of Pathology and Practical Medicine in the New York University, and William Gilman Thompson, M.D., Professor of Materia Medica, Therapeutics, and Clinical Medicine in the New York University, Physician to the Presbyterian and Bellevue Hospitals, New York. Vol. I. Infectious Diseases. Philadelphia and New York: Lea Brothers & Co., 1897.

To attempt to estimate a work of serial issue by its first volume is to hazard the charge of hasty conclusion. In point of fact, one could not reasonably expect uniformity in such an undertaking. Nevertheless, the character of this work is undeniably stamped upon the section under review, and can be expressed by no other term than comprehensive. The barrier between exhaustiveness and prolixity has been observed, and, excepting more or less historical matter, there is no superfluous "padding" in these unusually elaborate treatises. Thus far we are presented with a group of quite independent monographs, of whose quality collectively too much cannot be said. The introduction to the work leads one to suppose that this rule will prevail, and that the work will be the complete presentation of subjects in their individual bearing, rather than an attempt to combine and correlate them. The growth of knowledge has already so determined the necessities of the case that it is no longer necessary to apologize for a work which deals only with practice and its foundations. Principles of medicine are so broadened and dignified in recent years as to deserve separate consideration, and a work is by no means incomplete which confines itself to either. Hence, in the volumes to come, if the same adherence to the practical and demonstrated is shown, it is but implied that the equally high consideration of speculative medicine belongs elsewhere.

Proceeding upon this line, it is quite fitting that the subject of infectious disease should be foremost. By far the most brilliant of the results of modern scientific investigation are to be found here, and it affords a striking introduction. No attempt is made to bring into this category any of the diseases whose infectiousness is under any considerable question, which seems wise and consistent. Other diseases of unquestioned infectiousness, as, for example, pneumonia, are not included, perhaps by reason of natural relations to other departments.

We confess to a fear that the discussion of pneumonia may be destined to be as to its topographic rather than its toxic relations, and hence would have welcomed it among the infections.

The opening chapters by Welch and Thayer are a full statement of the subject of Malaria at this writing. The entirely new aspect which this classical disease assumes in the light of modern research is intelli-

gibly described. It is gratifying to find that so eminent an observer as Welch favors the examination for malarial organisms without a stain in clinical work. This preference seems to be growing. The suggestion that temperature may be conservative is not new but pertinent, and serves to arouse the reflection that temperature *per se* has been altogether too much a *bête noir*.

It would be an occasion for gratitude if Thayer's crisp disposal of the subject of typho-malaria might end it for all time.

There is no excuse to enter into detailed criticism of these chapters. They are eminently satisfactory. Dr. Hamilton West discusses Dengue without a special feature, except that he modifies the statement that there are necessarily two paroxysms, and insists, of course, on the non-identity with yellow fever.

Typhoid fever, or, as he prefers, enteric fever, is given by Dr. J. C. Wilson about sixty-five pages of the closest clinical analysis. No discussion has come under our notice more painstaking. Our attention is here and there attracted by conclusions with which we are not in harmony. The relative prevalence of typhoid fever in wet or in dry weather is obviously determined by the factors in etiology in any particular locality, and is likely to be largely topographic. Communities whose infection occurs by reason of accidental flushing of sewage into the water-supply are notoriously more afflicted in seasons of flood. The possibility of infection without the typical intestinal lesion is admitted. The estimate of 30 to 50 per cent. fatality in hemorrhage seems much too high, unless the phrase "subsequent perforation and peritonitis" may be made to carry much of the odium The loss of liver-dulness is not a safe clinical fact to tie to, in view of the various conditions in which it occurs. As usual, headache is set down as frontal, whereas the experiences of many agree that, while the frontal pain is usually present, the occipito-cervical pain is much more diagnostic. Proper emphasis is laid upon the atypical fever, concerning which most of the error in diagnosis arises, and consequent false conclusion as to therapeutics. Not enough stress is laid upon the fact that all the symptomatology becomes more or less atypical under the cold bath treatment, and that much of the literature descriptive of the "typhoid state" finds no illustration.

We second the emphasis laid upon disinfection of excreta, knowing well how inefficiently it is done.

A slip of the pen near the foot of page 210 makes poor water serve for good water.

The caution against fatiguing journeys after the onset of the malady is logical, but we think to be absolutely offset by manifest advantages in subsequent treatment if secured by the journey. The detail of treatment is admirably discussed, and invites no criticism except in respect to one question—alcohol. Possibly the text conveys an exaggerated impression of the reliance of the author upon alcohol as a routine. If it does not, we must seriously take issue upon this point. When one considers the element of toxæmia, the element of antitoxic effort, the element of elimination, and, further, the accumulating evidence that the relation of alcohol to these cardinal facts is either *nil* or unfavorable to the individual, we are driven from the time-honored position of reliance upon alcohol, and must relegate it to the class of emergency remedies, as to the merits of which much disagreement will be found.

Strychnine, to which many clinicians look with confidence, receives

but scant mention. The description of the bath-treatment is clear and calculated to encourage its use. One is inclined to differ from the view that the bath involves more labor. Nurses agree, so far as our inquiry has gone, that to accomplish the same results, even as to temperature, the bath is much less laborious than sponging.

A brief reference to the serumtherapy, properly non-committal, terminates the chapter. It is throughout a plain, full, instructive exposition of the subject.

Even this work, fresh from the pen of one thoroughly abreast of the time, is defective by the time it leaves the press. Since the edition, the Widal test for typhoid has arisen, been tried, and is rapidly taking its proper place as a diagnostic resource. Of course, of this there is no mention.

Considerable stress is laid upon hypodermoclysis and enteroclysis in the treatment of cholera. We welcome all practical suggestions looking to the utilization of this most rational procedure.

The chapter on Dysentery is remarkably fine. Dr. West has dared to classify clinically and with a clearness and conviction that carry one with him. His picture of coexistent or successive phases; his refusal to narrow his definition by single symptoms; his defence of calomel as a rational remedy, all go to stamp his effort as in harmony with the spirit of the work.

The relation of ptomaïnes to abscess of the liver opens a broad field, and is very lightly touched upon. The plates in illustration are superior.

Professor Wilson again gives a close description of Influenza. His position that it is a disease of short duration, but with long-drawn-out sequelæ, is perhaps correct. However, the continuance of a specific toxic agency to which the many different phases and stages of this serious disease are referable is beyond dispute.

An exhaustive study by Latimer of Cerebro-spinal Meningitis is of great value. His pathologic and bacteriologic data are abundant, and fortunately he is very conservative as to conclusions. He suggests what will appeal to all clinicians—a clinical meningitis without typical morbid anatomy—a typical morbid anatomy without symptoms. The logical tendency is to disassociate morphology from symptomatology, referring both to toxic causes. Upon this line much is yet to be said.

Pyæmia and Septicæmia, by Atkinson, are well handled. His discussion of the nature and relations of thrombosis is very clear. It is noticeable that he makes no allusion to lymph-thrombosis, in spite of the prominence which that subject has assumed in septic dissemination. No allusion is made to streptococcus antitoxin, possibly because of the recentness of its production.

The eruptive diseases are, without exception, carefully treated, and except for full commendation need little comment.

If we could only believe with Welch in the efficacy of sulphur fumigation, disinfection would assume a much simpler aspect. We do not find quite fully stated the very close diagnosis that very exceptionally has to be made between smallpox and chickenpox. One such case will last one a lifetime.

Robinson, in discussing Scarlatina, does not offer any explanation of the marked mitigation in severity in recent years, but generally his discussion is most satisfactory. Twice he uses the expression "scarlatinal rheumatism," which seems to be a misconception of the pathology as

recently accepted. It is hard to believe that the boiling of carbolic solutions effects enough good to offset their obvious disadvantages, or that it is necessary to resort to greasing of the skin.

The author quotes Wilson, of Philadelphia, as favoring the administration of chloral throughout the disease in doses sufficient to produce sleepiness without narcotism. Assuming that he is correct in quotation, it seems to be a plan open to decided objection and to be, on the whole, meddlesome.

We regret to note that the author is inclined to make his recommendations as to hydrotherapy less imperative, because of the objections from the family or friends. Is it not time to stop compromising with the truth out of respect to prejudice?

Diphtheria is treated in the full light of modern knowledge; a careful defence of serumtherapy is justifiable, considering how much opposition exists. The duality of croup is admitted, and, as it seems to us, justly weighed.

The subject of Tuberculosis, by Osler, is thoroughly treated, and, as usual, is systematic, definite, and judicial. The noticeable feature of his chapter is that it is quite up to date, nothing of importance being omitted.

The chapter on Syphilis is excellent, though not marked by any radical views. The generally accepted doctrines are adhered to.

Tetanus is well discussed from the standpoint of infection, and the serumtherapy fairly considered. It is clearly premature to say much about this treatment.

The volume under review is really a great work. No one can go to it without profit. If the volumes to come maintain this standard, it will be a source of great gratification that, coupled with the rising reputation of the surviving editor, the enduring fame of the great clinician shall have a worthy monument. H. B. F.

A Practical Treatise on Diseases of the Skin, for the Use of Students and Practitioners. Fourth and revised edition. By James Nevins Hyde, A.M., M.D., Professor of Skin and Venereal Diseases, Rush Medical College, Chicago; and Frank H. Montgomery, Lecturer on Dermatology and Genito-Urinary Diseases, Rush Medical College, Chicago. Illustrated with 110 engravings and 12 plates in colors and monochrome; pp. 808. Philadelphia and New York: Lea Brothers & Co., 1897.

This work is so well and favorably known to the profession that introductory remarks are unnecessary. The present edition has been altered in many places to meet the requirements especially of modern pathology and treatment, and much new matter has been added to the pages. Thus, we note changes in the articles on hydrocystoma, seborrhœa, erysipeloid, follicular eczema, seborrhœic dermatitis, and new matter or chapters on dermatitis repens, hydroa vacciniforme, mycetoma, angiokeratoma, protozoan disease, and in many other instances. Much now antiquated matter has been eliminated from the former edition.

We are pleased to observe that the authors are especially conservative in the nomenclature and the classification employed, the latter being

mainly that of the American Dermatological Association. This fact renders the book of special value to students. The treatise may as a whole be regarded as a complete exposition of our knowledge of cutaneous medicine as it exists to-day. In addition it contains the views of the authors on all important questions relating to the subjects discussed, and we have no hesitation in stating that the teaching inculcated throughout is sound as well as practical. Everywhere we find evidences that the authors are cognizant of all that has been done in dermatological literature of late years, and they have been generous in the presentation of the material that is likely to prove permanent. The labors of American dermatologists in particular are fully recognized wherever valuable contributions have been made.

Much work has been done lately in the study of ringworm, especially by French and English investigators, with the result that a new field in mycology has been opened up, all of which is here duly considered and discussed. Drs. Hyde and Montgomery say that "it seems to be established that there are at least two distinct and unrelated forms (of fungus) capable of producing the appearance classed as ringworm: the *microsporon Audouini*, or small-spored fungus, and the *trichophyton*, a large-spored fungus. In London, Morris, Fox, Adamson, and others find the microsporon is responsible for more than 90 per cent. of all cases of ringworm of the scalp in children, and that it also occurs in some cases of ringworm of the body, and even in some of the suppurating forms of the disease (as kerion). The trichophyton is comparatively rare in London." This entire subject of ringworm, as developed by Sabouraud and others, is new and full of interest.

We recommend the book cordially, and desire to call attention to the fact that the subject is approached from a scientific standpoint, with full appreciation, however, of the practical therapeutical side of the matter. The diction and style are easy and agreeable. The reader, as page after page is turned over, involuntarily feels that no effort is required in following the authors. L. A. D.

THE YEAR-BOOK OF TREATMENT FOR 1897. A CRITICAL REVIEW FOR PRACTITIONERS OF MEDICINE AND SURGERY. By sixteen contributors. 8vo., pp. viii., 480. Philadelphia and New York: Lea Brothers & Co., 1897.

THIS is the thirteenth issue of this useful publication, and this fact may be accepted as evidence that it fulfills the objects that led to its inception and have justified its continuance. In a succession of twenty-five sections there have been incorporated at such length as seems consistent with the importance of each subject treated the best of the new things in medical art and science that have developed during the preceding year. Each section is, beside, prefaced by a brief summary analyzing the work of the year in the respective departments of medicine, and in many places editorial comments in brackets are incorporated in the body of the sections. That the selections have been judiciously made and the work well done is assured by the names of the several contributors, while the convenient form of the volume, the neat typography, and the fulness of the indices add materially to its usefulness.

A. A. E.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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Xeroform (Bismuth Tribromophenol).—Dr. Josef Grünfeld states that this drug (1) not only possesses a powerful antibacterial action, but by combining with toxins and ptomaïnes renders them harmless, setting free bismuth, which makes insoluble compounds with these poisons; (2) it has marked drying and astringent properties; (3) it is also a deodorant, and therefore particularly useful for wound-cavities about the digestive or urinary tract; (4) it is not irritant either to wounds or to surrounding soft parts; (5) it relieves pain partly through its contained bismuth and partly through the protective covering which it forms; (6) it is non-poisonous, from 75 to 90 grains having been taken internally without harm; (7) it stimulates granulation-tissue and skin-formation, therefore shortening the period of cure; (8) it is hæmostatic. As a result of absence of pain and irritation there is but little or no general reaction subsequent to local disease in the majority of instances, and even severe operations are not followed by fever. In eczema from iodoform the result—complete cure in twenty-four hours—exceeded all expectation. In eczema madidans of mycotic origin the healing was rapid and sure. Externally this drug is used as a powder, in 10, 20, and 30 per cent. gauze, in ointment, in pencils, and in suppositories. The manner of use is similar to that of iodoform. The gauze can be sterilized at 230° F. In many cases irrigation of the wound may be omitted, the field of operation being cleansed with sterilized pads. To insure contact, all scabs, crusts, scales, pus, detritus, necrosed tissue, and blood-clots must be carefully removed. In support of the above propositions the author cites twenty-three instances of the use of the drug.—*Wiener medicinische Blätter*, 1897, Nos. 1, S. 6; 2, S. 26; 3, S. 43.

The Treatment of Chilblains.—Dr. F. W. Forbes Ross applies the secondary current of the faradic battery from five to fifteen minutes, increasing the current gradually to high strength, the poles being in contact with the

affected area, having previously dipped the electrodes in a saturated solution of sodium chloride. The tissues are gradually blanched, commencing after about five minutes. The itching is completely and promptly stopped by the first application, and a second, one or two days afterward, usually suffices for a cure. Seldom, if ever, does a third or fourth application become necessary.—*The Lancet*, 1897, No. 3832, p. 425.

Antitoxin.—Dr. E. Behring states that diphtheria-antitoxin, as such, is absolutely harmless when administered to man or animals in health or disease. In support of this proposition may be cited: (1) that blood-serum containing antitoxin in whatever proportion acts within the organism precisely as does blood-serum without antitoxin; and (2) that, although the antitoxin-content of serum has steadily increased, the severity and frequency of untoward symptoms have not increased. The antitoxin of choice is that purified from albuminous substances, salts, and by-products, concentrated to such a degree that the small dose can be largely diluted with water and yet not exceed the size of an ordinary hypodermatic injection, and, in addition, that it shall be a permanent dry preparation and protected from contamination in closed containers. Of great importance is the use of this substance in prophylaxis, conferring an immunity which, although temporary, is reasonably certain.—*Fortschritte der Medicin*, 1897, No. 1, S. 1.

The Antitoxin-treatment of Diphtheria.—Dr. B. H. Detwiler believes that when this remedy is used within thirty-six hours of diphtheritic invasion there is a gradual fading away of the exudate, with immediate return of appetite and strength. In recent cases one thousand units are ample for the average case; some require a second injection, according to the elevation or depression of the temperature. While confident of the ability of antitoxin to destroy the bacilli in the circulation, he, however, prefers to use a 1 to 2000 solution of corrosive mercuric chloride locally or by spray, with calomel, until it acts freely on the secretions, in order to prevent reinfection. In case of failure it is believed that there is either an insufficient quantity injected or that the preparation is not reliable. Of his own cases, twenty-three in number, but one died, and that was a child of six months.—*Therapeutic Gazette*, 1897, No. 1, p. 1.

The Inhalation of Formalin.—Mr. J. Lardner Green considers that the most rational treatment of catarrh and other diseases of the respiratory tract is by means of germicidal remedies, the most direct mode being by careful inhalation of a gas or vapor. The best results have been obtained from the vapor of formalin, one or two drops being placed inside of a respirator. If the disease be in the acute stage, one drop diluted with water will suffice. If the vapor be too stimulating, the respirator should be temporarily removed from the face to dilute the vapor with air; a feeling of warmth and comfort will follow. The use of this method is strongly advised in the early stages of tuberculous consumption, when usually it will be found, on microscopical examination of the sputum, that the number of both the micrococcus pneumoniæ and also of the bacillus tuberculosis will be rapidly lessened.—*British Medical Journal*, 1897, No. 1822, p. 202.

Treatment of Pulmonary Tuberculosis.—Dr. Bertola has treated nineteen patients with the serum of Maragliano. From his observations he concludes that (1) it gives rise to no general or local reaction; (2) it is well borne and without ill effects upon heart or bloodvessels; (3) it lessens and subdues fever; (4) it improves the general condition and increases, in nearly all cases, the body-weight; (5) it possesses a specific action upon the tuberculosis, but should be administered for a long time.—*Therapeutische Monatshefte*, 1897, Heft 1, S. 37.

The Treatment of Intestinal Toxæmia.—Dr. Matthew D. Mann, in searching for an intestinal antiseptic, believes that naphtalin has met with the most favor. Bismuth subgallate, as well as nearly all of the agents which have been tried, has disappointed. Benzosol is worthy of a more extended trial. Practically, hydrochloric acid seems to give satisfaction, and in support of its use is the theory of Simon that the free hydrochloric acid of the gastric juice keeps intestinal putrefaction within limits. Very careful regulation of diet and attention to the general surroundings, environment, and hygiene of the individual are the best agents; these include the proper ingestion of water, the use of massage, exercise, fresh air, and sunshine.—*Yale Medical Journal*, 1897, No. 4, p. 149.

The Treatment of Infectious Pyelonephritis.—Messrs. Bovet and Huchard give an instance of the successful use of subcutaneous injections of a saline solution of sodium chloride. They were dealing with pyelitis from repetition, which, after a chilling, passed rapidly into an infectious pyelonephritis with phenomena of general intoxication. These cases are by no means rare among the richer patients, whose occupation does not permit them to satisfy, at the desired time, the excretory functions of the intestine and bladder. If careful inquiry is made, it will be learned that their urine is almost always turbid, of a strong odor, and deposits mucus, often pus, and perhaps with a trace of albumin. With these patients, after a too copious dinner or a fatiguing ball they may be taken with a chill, which is followed by a fever, bilious attack, and pains in the lower limbs, which may suggest the onset of influenza or typhoid fever. The urine, upon examination, will be found to be diminished in quantity, dark in color, depositing mucus or pus containing a third, or less, of 1 per cent. of albumin and a notable proportion of urobilin. This deposit may already contain the germs of a latent infection, and needs only an opportunity to awaken a condition which leads to uræmia or other form of poisoning. Such an instance is reported in detail in which success followed the use of a seven *per mille* serum, both hypodermatically and by the rectum. The urine showed the following changes: (1) Increase from twenty to fifty and even sixty-five ounces. (2) The chlorides increased more than fivefold. (3) The albumin diminished to one-thirtieth of its original amount. The largest daily amount used hypodermatically was twenty-six ounces; by the rectum it was sixty-six ounces.—*Bulletin Général de Thérapeutique*, 1897, 2 liv. p. 75.

Treatment of Gonorrhœal Cystitis.—Dr. M. Harovitz counsels rest in bed, avoidance of all local irritations, administration of morphine, codeine

rectal suppositories or of extract of hyoscyamus, use of local warm baths, forbidding of spices, alcohol, and carbonated waters, and the giving of laxatives. Priapism can be avoided by the bromides, with camphor or cannabis indica. For the cystitis itself, salol, in three doses of fifteen grains each, sodium salicylate or sodium benzoate is useful. Naturally the balsams, oil of santal, cubeb, and kava-kava are to be considered. If the digestion is excellent, balsam of copaiva, balsam of Peru, and oil of turpentine may be employed. Of importance is the use of infusions, as of uva ursi, quite likely on account of their diluting the urine. If there is delay in the disappearance of the symptoms, then, after emptying the bladder of residual urine, an injection of three ounces of a one *per mille* lukewarm silver solution will be necessary.—*Centralblatt für die Gesammte Therapie*, 1897, Heft 2, S. 65.

Treatment of Puerperal Fever.—Dr. A. J. Iwanoff presents an argument for the use of inunctions of gray mercurial ointment. Eight instances of its employment are cited, all of recovery. In general two inunctions only were necessary, each of a little less than an ounce of the ointment, the first into the skin of the abdomen, the second, an hour later, into that of the lower extremities. The inunction lasts an hour, and the residue of the ointment is removed with warm olive oil, the skin washed and dried with cotton and protected by waterproof dressings and flannel. Frequent washings of the mouth with a 4 per cent. solution of potassium chlorate should be made during the treatment and in some instances six-grain doses thrice daily given internally.—*Therapeutische Wochenschrift*, 1897, No. 4, S. 73.

The Treatment of Syphilis.—MM. H. Hallopeau and G. Bureau present the following formula for hypodermatic injection: mercury salicylate, 4; oil of vaseline, 30. The mercurial salt is fused, washed with boiling alcohol, dried in an oven, triturated in a sterilized mortar with the oil of vaseline, and then placed in a sterilized flask. The material should be freshly prepared and thoroughly fused, otherwise it will obstruct the needle during injection. They conclude that: (1) Intramuscular injection of this preparation is one of the best methods of administering mercury. (2) The pain to which it gives rise is bearable by the great majority of patients. (3) It never produces salivation. (4) Only with great rarity does it produce local suppuration (twelve times in 176,000 injections, Tarnowsky). (5) If, by fault of administration, the injection enters the veins, the symptoms of pulmonary embolism rapidly disappear, without serious consequences. (6) The treatment is remarkably active. (7) It is not contraindicated in case of albuminuria of syphilitic origin. The dose of the salt is one grain twice each week.—*Bulletin Général de Thérapeutique*, 1897, 1 liv., p. 15.

Concerning Suppositories.—Drs. L. Lewin and F. Eschbaum place as essential requirements of a suppository that (1) the drug shall be evenly disseminated through it; (2) rapidly and easily separated from it; (3) be as sterile as is possible; (4) be easily introduced; and (5) be capable of exact dosage. The cocoa-butter suppository fails in the first requirement because the drug is incorporated while the vehicle is liquid from the application, and during the cooling settles in the apex, so that this contains more of the drug than the base.

The glycerin-gelatin suppository presents the disadvantages of (1) being generally not sterile; (2) the source of the gelatin is unknown and may contain improper substances; and (3) the quantity of glycerin may produce local irritation. The agar suppositories are made as follows: the commercial agar is powdered and heated with twenty-nine parts of water in a bath until it becomes a gelatinous mass. The acidity is now neutralized by the addition of 1 per cent. of sodium bicarbonate, and the mass is ready for use. In practice, however, the powder is neutralized, the drug added to it, and both with the above amount of water transferred to a flask, which is tightly corked, heated over a water-bath, and the contents poured into the moulds. This method results in an even distribution of the drug through the suppository. —*Deutsche medicinische Wochenschrift*, 1897, No. 2, S. 20.

The Use of Iron in Chlorosis.—Dr. Israel concerns himself with the choice of this preparation. His preference is for the liquor ferri sesquichloridi, which, in the German Pharmacopœia, contains 10 per cent. of iron. This is administered as one drop in a wineglass of water thrice daily after meals, increasing by drops until the patient receives twelve drops daily. Thus given it is a refreshing drink, improves the appetite, and, if a glass tube is used, will not blacken the teeth.—*Therapeutische Monatshefte*, 1897, Heft 1, S. 21.

Bismuth Tribromophenol.—Dr. Charles Greene Cumston states that this compound is recognized as most active of all the groups of antiseptics: first, because it contains, besides 49 per cent. of bismuth oxide, 50 per cent. of tribromophenol; and, secondly, because the latter is more antiseptic than phenol. The substance may be heated to 230° F., and therefore sterilized without decomposition. It possesses a large field of usefulness in surgery. In open wounds, those in which no infection has taken place, it will secure union by first intention. It appears to exercise a calming influence upon burns, like iodoform. In some cases of *pruritus localis sine materia* the itching was stopped by its application. When used after the curettement of tuberculous abscess or glands cicatrization was rapid. On account of the continual development of tribromophenol and bismuth oxide a wound will be kept in a perfectly aseptic condition, while the slightly irritating action of the former gives a fresh and healthy aspect to the wound. Since iodoform produces granulation-tissue it may be first applied, and later cicatrization can be accomplished with the bismuth product. In gynecological cases it appears to have a marked influence upon the regeneration of the epithelium. In no case did any toxic symptoms appear, although the drug has been freely used. It is strongly recommended as a safe and sure antiseptic, and in many respects superior to iodoform or other powders of this class.—*Boston Medical and Surgical Journal*, 1897, No. 2, p. 37.

The Serum-treatment of Malignant Growths.—Dr. W. H. Happel reports three instances, in the last of which there was central sloughing with peripheral increase, which shows rather conclusively that the action of the serum is local and due in great part to a limiting peripheral inflammation set up by its use. It does not, therefore, correct any dyscrasia. For this reason

large tumors will never give very good results, as it will be impossible to place enough injections about the periphery of the growth, in most cases, at intervals of time sufficiently short to destroy the growth before the latter destroys the patient. In fact, the practical disappearance of the growth and the simultaneous death of the patient have been observed sufficiently often to teach us that the cancerous dyscrasia may kill a patient under serum-treatment even while the tumor is palpably diminishing, and that, consequently, the serum-treatment should be strictly confined to absolutely inoperable cases and should not be employed while the knife can still be used. —*Albany Medical Annual*, 1897, No. 1, p. 21.

Picric-acid Stains.—M. CRÉQUY, having made use of the picric-acid treatment for burns, has found that there remained an indelible yellow stain upon the skin. It has been suggested by Brun that for these stains upon linen a prolonged immersion in boric-acid solution suffices for their removal, but this is much less effectual for cutaneous stains.—*Revue de Thérapeutique*, 1897, No. 3, p. 85.

The Treatment of Recurrent Mammary Sarcoma.—MR. A. MARMADUKE SHIELD reports a single fatal instance of the use of the mixture of the toxins of the streptococcus of erysipelas and the bacillus prodigiosus. There was evidently no reason for the result either in the fluid or the method. A smart reaction followed the first two injections. After that these injections made in increasing quantities failed to have effect. After a week's interval severe reaction was again established. The injection caused undoubted shrinkage and apparent disappearance of the growth, but this seemed due purely to inflammatory action in a soft neoplasm rather than to any purely specific action of the fluid. At the necropsy signs of general pyæmia were present; secondary abscesses and infarcts were found in the liver, myocardium, kidneys, and right knee-joint. The growth beneath the clavicle was necrotic, and it was particularly important to note that beneath the site of the nodules which had disappeared there was some purulent infiltration of the thoracic muscles. In the secondary abscesses the staphylococcus aureus was found. This is noteworthy, as the original fluid was prepared from streptococci. In this instance the serious nature of the disease justified the employment of a perilous mode of treatment, which undoubtedly shortened life. Slater sums up this method in stating that the treatment with toxins is occasionally successful, but gives rise to severe symptoms.—*British Medical Journal*, 1897, No. 1822, p. 193.

Poisoning by Antipyrin.—M. DALCHÉ reports an instance of an ulcero-membranous stomatitis following the ingestion of fifteen grains of this drug. A month later, after the same dose, there were noted swelling of the mouth, bleeding from the gums, numerous ulcerations of the mucous membrane of the tongue, lips, and cheeks. Four weeks later, after a single dose of one-half this amount, there rapidly supervened an intense, acute coryza, swelling of the mouth, and an insupportable itching of the thorax, abdomen, and scrotum. Four days later ulcerations the size of a pea, covered with false membrane, were found upon the lips; the gums were bleeding and presented a

red border, but the tongue was free. The abdomen exhibited a purpuric eruption, which had commenced to fade, and upon the scrotum were three small but markedly painful ulcerations. The patient had been in good health until a few months before this observation, although for four years he had complained of hepatic colic, for which he had visited Vichy each summer. At his last visit sugar had been found in the urine, but no albumin. During the second attack, above noted, neither sugar nor albumin was found, but an excess of urates and phosphates. During the last attack there was no albumin, but over 3 per cent. of sugar, an excess of sodium urate, with normal amounts of urea and phosphoric acid. There were no disturbing symptoms of diabetes, as polydipsia or polyphagia, and his reflexes were normal.—*Bulletin Général de Thérapeutique*, 1897, 1 liv. p. 29.

MEDICINE.

UNDER THE CHARGE OF

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Recovery from Addison's Disease after Removal of a Tuberculous Adrenal.—OESTREICH (*Zeitschrift für klin. Med.*, Bd. 31, p. 123) reports the following: a woman, aged fifty-five years, complained for three or four years of gradually increasing, finally extreme muscular weakness, malaise, palpitation of the heart, shortness of breath, and œdema of the feet. For six months there were night-sweats, pain in the epigastrium, and vomiting. Blood was never vomited. There was decrease in weight from ninety-eight to seventy pounds. Physical examination showed slight dulness and harsh respiration over the left apex. The sputum was free from tubercle-bacilli. In the stomach-region, lying directly on the spinal column, was a small, movable, firm, nodular tumor. Pressure over it brought on a characteristic attack of pain. There was slight dilatation of the stomach. On distending the latter the tumor could not be felt. There was free hydrochloric, but no lactic acid. The skin and mucous membranes were not bronzed. The diagnosis was retroperitoneal glandular tumor, and, being considered the cause of the symptoms, an operation was performed.

The tumor was readily found, in close relation to the aorta, so that at first it seemed possibly aneurismal. It was finally removed, leaving the aorta exposed for a distance of 8 cm. The other relations of the tumor were not accurately made out. The patient recovered in two weeks. All the symptoms disappeared after the operation. Eight months later she was well, weighed eighty-seven pounds, and was stronger than she had been for years.

The tumor proved to be a tuberculous adrenal, partly caseous, partly calcified, containing bacilli. The medullary part was almost entirely destroyed by the growth, but portions of the pigment-layer were present. The mass had a thick fibrous capsule, which, however, had not limited the spread of the growth, as there were fresh tubercles in the surrounding fat. After some general remarks, and a discussion of the diagnosis made, the author makes a plea for similar operations. The diseased adrenal can be more readily removed than a healthy one, being larger and more consistent, having a thick capsule, and the retroperitoneal fat being diminished. In such operations both adrenals should be exposed, their condition determined, and one or both removed, according to the indications.

Surgical Scarlatina.—INGERSLEV (*Zeitschrift für klin. Med.*, Bd. 31, p. 171) reports three cases in which scarlet fever began in solutions of continuity of the skin, the patients having been exposed to other cases of scarlatina. In one case the virus was probably introduced through a paronychia and corresponding lymphangitis. In the other two, wounds from burns furnished the points of entrance. The symptoms in all the cases were characteristic, except as regards the throat-symptoms. In the first case the pharyngitis developed late and was mild; in the others there was only a mild efflorescence in the throat. The author suggests that if a careful examination of the skin were more frequently made in scarlatina with mild throat-lesions, cases similar to those now reported would be more frequent, a wound in the skin being easily overlooked.

Alterations in the Kidneys in Atrophic Infants.—SIMMONDS has endeavored to throw more light on the cause of the renal alterations which various observers have found in infants with acute and chronic gastro-intestinal disease. He examined the bodies of sixty atrophic infants without intestinal catarrh, excluding also cases of lues, acute infections, severe suppuration, tuberculosis, and catarrhal pneumonia. In all cases the kidneys showed lesions in the parenchyma of various degrees of severity. These changes bore no relation to the severity of the atrophy, nor could they be explained by the medicinal treatment or by complications such as rickets or catarrhal pneumonia. The only constant change in all the cases was an exudative inflammation in the tympanic cavity. The author looks on this as the source of the renal degeneration, holding that large numbers of pathogenic microbes develop in the tympanum; that they or their toxins enter the circulation and so produce the degeneration in the kidneys. In many cases the same kinds of bacteria were found in the ear and the kidney. From these investigations the author concludes that the renal changes following gastro-intestinal disease may also be due to inflammation in the ear. —*Deutsches Archiv f. klin. Med.*, Bd. 56, p. 385.

Gastric Mycoses.—SCHMILINSKY (*Jahrb. der Hamburg. Staatskrankenanstalten*, 1893–'94, iv. p. 388) reports some rare cases of gastric disease. One was a case of primary anthrax of the stomach. The patient died after four days' illness, without a diagnosis being made. Autopsy showed swelling and hemorrhagic infiltration of the bronchial and mesenteric glands. There was

swelling of all the mucous membranes of the stomach, with a number of blackish-red elevations, and a number of erosions in the pylorus. The cæcum contained small blackish-red elevations. Microscopic and bacteriological examinations of the glands and the foci in the stomach gave a pure culture of anthrax bacilli. These were especially in the lymph-vessels around the glands in the mucosa. The superficial lesions showed streptococcus only.

In a case of streptococcus infection after scarlet fever and diphtheria the stomach was found affected much as in the preceding case, but here the cocci were found in the submucosa especially. The cocci were partly in the lymph-spaces, partly in the tissues.

In a third case, an atrophic infant a month old, a whitish elevation the size of a pin-head was found in the pylorus. The umbilical artery contained pus. The necrotic papule in the stomach contained a bacillus like the colon bacillus, partly in the tissues, partly in the arterioles. It is possible the umbilical stump was infected with fecal matter.

The Diaphragm-phenomenon of Litten in Pulmonary Tuberculosis.— Dr. E. Rumpf (*Berliner klin. Wochenschrift*, 1897, No. 6) publishes an interesting analysis of the study of the diaphragm-phenomenon in seventy cases of pulmonary tuberculosis. He points out, in the first place, the possible causes of error, such as imperfect breathing on one or both sides, sometimes found in healthy subjects, and emphasizes the importance of deep abdominal breathing in testing the mobility of the diaphragm. His results in tuberculosis include many interesting details too lengthy to quote, but the most important feature may be summarized as follows: Litten's statements were confirmed, viz, that the motion of the diaphragm is normally visible between the seventh and ninth ribs, and has an extent of 6 to 7 cm. In tuberculosis, at least when it produces symptoms, variations from the normal are very frequent, but the existence of a normal Litten's phenomenon does not exclude tuberculosis. Out of the seventy cases the symptom was absent five times, in mild cases with the disease limited to the apices. In a sixth case it was absent, although there were remains of old pleurisy over both bases. On the whole, Litten's sign has only relative importance in the diagnosis of tuberculosis. Normal extent does not exclude the possibility of disease, and an abnormal diaphragmatic motion can occur in health or in various diseases. At most we can say that a normal movement excludes disease involving the greater part of the lungs. The phenomenon is useful in determining improvement in the breathing. The author found that the motion in some cases was doubled in extent during treatment. It may also be useful sometimes in detecting simulation. But the facts that the phenomenon does not correspond to the severity of the disease, that various diseases, and even such things as sex, obesity, habit, intelligence, and the inclinations of the patient affect its development will prevent Litten's phenomenon from being widely used in practice.

Idiopathic Dilatation of the Œsophagus.— Rumpel (*Berliner klin. Wochenschrift*, 1897, No. 6) presented an interesting case of this kind before the *Aerztlicher Verein* in Hamburg. The patient was a man of twenty-five

years, who began to have vomiting after a severe attack of pneumonia. There was pain on swallowing. The conditions resembled nervous vomiting. On passing a tube 28 cm. into the œsophagus, 250–300 c.cm. of slightly alkaline fluid were obtained. After pouring in weak blue litmus solution it was withdrawn unaltered and in the same quantity as before. After manipulating the tube for some time the patient was able to pass it into the stomach. It was then possible to pass a thin tube into the œsophagus beside the tube in the stomach, and wash out the two organs separately. Further experiments showed that the dilatation of the œsophagus was diffuse and not lateral. The reporter considered the condition due to a spasmodic stricture of the lowest part of the œsophagus.

Degeneration of the Liver in Gastroenteritis.—Dr. Martin Thiemich calls attention to a subject that has not been as carefully studied as its importance seems to warrant. In fact, not only have some authors asserted that the degenerative changes in the liver here referred to are of no importance, but a few have even denied their occurrence, or have mistaken the drops of fat for "vacuoles." The author examined the livers in thirty-two cases of gastroenteritis, with one exception from infants in the first year. None of the subjects had symptoms of acute yellow atrophy. In nine cases there was no fatty degeneration, or at most a few droplets in the periphery of the acini, with well-staining liver-cells. In twenty cases the liver was slightly enlarged or of normal size. There was fatty degeneration of moderate degree, varying widely in distribution in different cases In some the periphery was fatty degenerated, in others there was an area of degeneration around the central vein, in others the distribution was very irregular. The fat varied in size from the finest grains to large drops, distending the liver-cells and pressing the nuclei to the sides. The nuclei were often degenerated. In three cases the fatty degeneration was far advanced. The livers were large, pale-gray, and of low specific gravity. Sections showed total degeneration of liver-cells; in fact, so extensive was the accumulation of fat that it was often impossible to say whether it was in the cell or not. There were in such cases collections of small cells along the vessels. The question whether the fat in these cases came from food could easily be answered in the negative, as most of the patients took none in the last days of life. Alcohol had not been used. The author shows the futility of trying to determine in such cases whether the condition is one of degeneration in the strict sense, or infiltration. The fact remains that the presence of the fat in such cases is pathological, and the author inclines to the opinion that the fat is deposited because the cells are diseased and their metabolic function impaired. The cause of this he finds in an intoxication, either by bacterial poisons, by products of intermediate tissue-change, or poisons from the food. The importance of such processes in the symptomatology and prognosis of intestinal disease is evident, but requires much further investigation.—*Beiträge zur path. Anat.*, Bd. xx. p. 179.

Presystolic Apex-murmurs.—Kasam-Beck (*Centralblatt für inn. Med.*, 1897, No. 6) has examined this subject in the literature and clinically. In sixteen out of nineteen cases in which a presystolic murmur was audible in

the apex-region, there were symptoms of aortic insufficiency and mitral stenosis; but post-mortem examination showed no narrowing of the mitral orifice. In other cases with similar murmurs adhesive pericarditis was disclosed. Phear reported a similar case where only enlargement of the left ventricle was present. The author refers to the cases reported by Flint, Guitéras and Fischer, and also to a case of Picot, in which a presystolic murmur was ascribed to hysterical contraction of the papillary muscles. The author's own case, a man aged sixty-three years, complained of pain in the thorax spreading down the arms, and marked dyspnœa. There was venous pulse in both sides of the neck and in the thyroid and mammary veins. The apex-beat was in the sixth interspace outside the nipple-line, and very strong. The arteries were sclerotic, the radial easily compressible. The heart-dulness was enlarged in all directions. At the apex was a loud presystolic murmur with a dull first and a loud second sound. Over the tricuspid the first sound was dull, the second loud and pure. The second pulmonary sound was accentuated. The diagnosis was stenosis and insufficiency of the mitral valve, relative insufficiency of the tricuspid, dilatation and hypertrophy of both ventricles, arteriosclerosis.

Autopsy showed no stenosis of the mitral orifice, but relative insufficiency of both venous orifices. In the apex was an aneurismal dilatation the size of an apple. There was marked arteriosclerosis, affecting especially the vertical branch of the left coronary artery. The author explains the presystolic murmur by the change in the blood-currents caused by the aneurism. The absence of systolic murmurs is interesting.

Tabes Dorsalis and Movable Kidney.—Dr. A. Habel (*Centralblatt für inn. Med.*, 1897, No. 7) calls attention to the coincidence of these two conditions in Eichhorst's clinic. Aside from reports by Eichhorst and Brieger the matter does not seem to have been mentioned before. Since 1885, in the clinic named, sixty-eight cases of tabes were treated. Twenty-four of these were in women. In six cases, all women, there was movable kidney, in one case movable liver also. This proportion of cases with movable kidney is, of course, not remarkable in itself; but Habel rightly says it is remarkable in that the total number of cases of movable kidney among the women patients of the clinic was only 1 per cent. The author thinks it possible that tabes may favor the occurrence of movable kidney, and fortifies himself with the analogy of neurasthenia. He suggests that the condition may be due to emaciation or to a relaxation of the abdominal ligaments. The fact that movable kidney was found only in the women tabetics is not overlooked by Habel, but any possible objection to his argument is met with the true but remarkable answer that movable kidney is rare in men. The article is of value in calling attention to a matter not generally considered, but the author should tell us when he writes again on the subject how he explains the very large proportion of women tabetics in his series. His method of arguing might lead to the conclusion that floating kidneys cause tabes in women.

Paroxysmal Tachycardia.—Bunzel (*Prager med. Wochenschrift*, 1896, Nos. 28 and 29) reports the case of a woman, aged fifty years, who had rheu-

matism sixteen years ago, and who for two years has had attacks which begin with a feeling of heat along the back and a diminution of the size of the pulse. Then rapid pulsations begin in the jugular veins, and the head nods synchronously. The lung-boundaries and respiration are normal. The heart-dulness during the intervals reaches the middle of the sternum. There are loud diastolic murmurs in the apex and mitral areas. In the attacks the cardiac dulness becomes enlarged to the right and above; the pulse rises from 72 to 164; epigastric and hepatic pulsations appear, and a tone can be heard in the crural arteries. There is never œdema or alteration of the quantity of urine. In the attacks the urine shows cloudiness with acetic acid and potassium ferrocyanide, and numbers of oxalate crystals. The attacks occur without reference to eating, usually in the afternoon. They end suddenly with a feeling of palpitation. Ice locally, and bromides, do not influence the attacks, but caffein and digitalis seem to prevent them for some time. During the attacks the blood-pressure is low. Bunzel shows that one may explain the attacks by supposing, with Martius, there is a primary lowering of the tone of the heart-muscle, and that, as in Knoll's experiments, the sensory nerves of the heart are irritated and the irritability of the vagus lowered. On the other hand, the vagus might be inhibited by some other cause, and the frequent beats and consequent short diastole of the left ventricle cause congestion of the right ventricle and the veins of the general circulation.

The Larvæ of Flies as the Cause of a Chronic Pseudomembranous Enteritis.—Most cases in which insect larvæ have been thought to come from the intestinal tract have been of short duration, the larvæ found by accident, and their origin often doubtful. A remarkable exception is reported by HENSCHEN (*Wiener klin. Rundschau*, 1896, No. 33). A peasant, while bathing in a brook, drank some of the muddy water. He noticed later that the water was full of red insects. In two or three weeks he had abdominal pain and diarrhœa, without vomiting. The diarrhœa continued, interrupted by attacks of severe constipation. There were seven or eight pale watery stools daily, with masses of mucus sometimes many feet long. At times blood was passed. Usually larvæ were passed with the stools. Various remedies were used, but mostly only with the result of increasing emaciation. The most effective remedy was a combination of kamala, kousso, and male-fern. This caused the expulsion of large masses of larvæ, and was followed by long-continued relief. The larvæ were cylindrical, articulated, without feet, measured 7 to 16 mm. in length, and 1 to 2 mm. in thickness. The heads were black. The animals were lively and vigorous. The entomologist Aurivillius assigned them to a species nearly related to the common house-fly.

[It is well known that in certain species of flies the larvæ are capable of reproducing larvæ.]

Congenital Cirrhosis of the Liver in Syphilis.—MARCHAND (*Centralblatt für allg. Path.*, 1896, No. 7) reports a number of cases of syphilitic livers in infants. The most common change was the one in which there are irregularly distributed foci of degenerated liver-cells, with small-celled infiltrations. Such cases eventually lead to the distorted syphilitic liver. In

one case, however, the liver was almost normal in macroscopic appearance, but microscopically showed a widespread and intense round-celled infiltration in the portal capillaries. This form probably passes into a genuine hypertrophic cirrhosis in later life.

SURGERY.

UNDER THE CHARGE OF

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The Surgery of the Peritoneum.—MR. FREDERICK TREVES has devoted a great deal of time to the study of the peritoneum, and his observations have been an important factor in the development of the present advanced state of the surgery of this structure. We therefore naturally read with great interest his "review" of this subject (*British Medical Journal*, 1896, No. 1870).

Mr. Treves advocates the simplest possible technique in the preparatory details and during an operation. While not sacrificing any of the essentials, he avoids those extravagant measures that savor more of ostentation than a rational interest in the welfare of the patient. The author still retains his confidence in the value of iodoform as a part of the dressing of wounds.

The advance made in our knowledge of peritonitis has been mainly in an appreciation that all the varieties hitherto considered as different forms are due to infection and are practically identical in their consequences. The constitutional symptoms of peritonitis are due to septic intoxication, and in the fatal cases death is due to blood-poisoning. Great harm has been done in the past, the author believes, by what has been termed "the toilet of the peritoneum." In removing accumulations or tumors from the abdominal cavity every precaution should be taken not to disturb the peritoneum beyond the immediate area of the operation, by the appropriate use of gauze-pads, etc., so that extensive flushing or sponging will be unnecessary. Peritonitis not involving the "small intestine area," subphrenic, iliac, and pelvic, is apt to be localized, and the surgical treatment of the affection in these situations is very successful. If the "small intestine area" is involved, however, the inflammation spreads rapidly and evidences of profound constitutional poisoning precede the usually fatal issue. The results of surgical interference in these cases, Mr. Treves says, "at the best are not brilliant, and it is evident that the treatment of this terrible complication must still incline toward that desirable prevention which is better than cure."

The author still retains the term "perityphlitis." While he is perfectly familiar with the comparatively much greater frequence of primary inflammation of the appendix, the evidence before the profession warrants the assertion of the existence of true peritonitis due to primary ulceration of the cæcum. This does not refer to epithelioma, actinomycosis, or tuberculous disease, but to non-malignant, non-parasitic ulceration of the bowel. Those cases are also excluded in which perforation of the cæcum is secondary to an appendicular abscess.

Our knowledge of the etiology of this disease, the author states, has not been added to by the "exuberant analytical discourses of some recent writers." He advances the suggestion that the process is comparatively simple. "A catarrh leading to ulceration would appear to be the commonest factor, and it is this condition which precedes that stricture of the appendix which is so frequently discovered. . . . Foreign bodies, seeds, and fruitstones play practically no part in the etiology of perityphlitis." The very few instances of real foreign bodies found in the appendix have been mostly small shot, pins, fragments of nut-shell, and bristles. Very many of the concretions are wonderfully accurate representations of certain seeds and fruitstones, and in some cases only division of the foreign body will reveal its true nature.

The statistics of Miles F. Porter, which give the common death-rate at about 14 per cent., are quoted. These figures, the author states, must have been derived mainly from hospital cases. He would place the general death-rate for all classes of cases at about 5 per cent.; but it may reach 30 or 40 per cent. in those complicated with abscess.

The subject of a perityphlitic abscess, it is stated, is by reason of that abscess, in the majority of instances, cured of his trouble should he survive. Sometimes an abscess that has been drained closes, only to open again, or a sinus may remain unhealed; but a second "perityphlitis" is very rare in these cases.

In regard to the question of treatment Mr. Treves says: "I have no reason to alter the opinion expressed some years ago that in dealing with cases during an attack an operation is seldom called for before the fifth day. Terms too strong cannot be used to condemn the practice of immediate operation; by that I mean the exposing of the appendix as soon as the diagnosis has been made. There is no sound basis for this procedure in either the pathology or the clinical prospects of the affection. It is not to be disputed that a fatal attack may commence mildly, and that it is not possible to foretell the degree of an attack by its mode of onset. The course of perityphlitis is, however, not so erratic as some maintain, and careful observation of each movement of the disease is not an unreliable basis for treatment. It is true that some intense attacks end in death in forty-eight hours; but if the whole range of the disease be reviewed, it is safe to say, with precision of language, that these terrific phases of the malady are exceedingly rare on the one hand and are not difficult to recognize on the other.

"In such extreme examples an operation cannot be done too soon. The assurance that simple incision is attended by a death-rate of 18.18 per cent. is not an encouragement to operate as a matter of routine. I need not add that evidence or strong suspicion of the presence of pus indicates immediate

interference, and a like course is clear should the swelling continue to increase with no abatement of the fever and other symptoms.

"When an abscess is evident or suspected the locality of the incision must be determined by the area of dulness and of resistance. Should the wound be made too far to the inner side as to miss the collection and open the peritoneal cavity, that incision should be closed and a fresh incision made at a point where the evacuation of the pus within the enclosed area can be effected. The incision should be free; the abscess-cavity is gently examined as to its position and extent, and information obtained as to the situation of diverticula. These diverticula can be cautiously opened up with the finger. No elaborate search should be made for the appendix. Such search means risk to the frail abscess-wall, and to that often feeble barrier of adhesions which isolates the pus from the general peritoneal cavity. Continued trouble may follow from a retained concretion, and as such a substance is usually easily to be felt, it should be sought for and removed. Should the diseased appendix actually present itself, it can be ligated and taken away. The high mortality accredited to this operation depends, I cannot help thinking, upon a blind resolve to excise the vermiform process at all hazards. The operation is concerned with the evacuation of an abscess, and those cases do best in which the least is done, provided that a free evacuation of the pus has been secured. The cavity does not need to be squeezed; it does not call for irrigation nor for sponging out, and least of all for scraping. As for drainage, nothing answers better than the iodoform-gauze drain properly cut and carefully introduced."

The risk attending the removal of the appendix in the period of quiescence, first proposed by the author in 1888, has been in his experience less than 1 per cent., and is therefore less than that of a recurrence of the inflammation. In the majority of cases, however, the attack is single, but we have as yet no reliable figures on this point.

The very interesting paper concludes with the following rational statements: "The treatment of a diseased appendix involves no new surgical principle and calls for no labored inventions. The treatment of the abscess is based upon those great general principles which underlie the treatment of all abscesses, and the removal of the little organ demands no departure from those accepted procedures which belong to the common lore of surgery."

Excision of the Tarsus.—LAUDERER (*Cent. für Chir.*, September 5, 1896, No. 36) gives a new line of incision for reaching the tarsus and contiguous structures. The incision begins at the insertion of the tendo-Achillis and extends in the median line on the plantar surface of the foot down to the bone. It divides no vital structures, simply the fat, plantar fascia, and the flexor digitorum muscle in a line parallel to its fibres. The splitting of the tendo-Achillis upward will do no injury if it is necessary. By holding the parts apart with sharp retractors all the bones of the foot may be readily reached by the use of the periosteal elevator, and easily removed.

The position of the incision is very serviceable in the after-treatment, as drainage is good. A light antiseptic packing is useful to prevent the too early adhesion of the edges of the wound. The deformity produced is very slight and can be corrected by a thickened sole on the shoe. There is no

difficulty from the scar-tissue, as it contracts and sinks deeply and is consequently free from pressure.

A New Truss for Inguinal Hernia.—WALFERMANN (*Cent. für Chir.*, 1896, No. 15) describes a new truss having a long oval pad of inflated rubber which covers the entire inguinal canal. It is hinged to the spring surrounding the body, and so regulated by means of a spring and lock between it and the body-spring that a continuous even and easily regulated pressure is exerted over the entire canal.

The author claims for it the following advantages:

1. Uniform pressure over the entire length of the inguinal canal, so that the anterior and posterior walls are firmly pressed together.

2. A backward pressure of the abdominal parietes, so that a convexity is produced on the internal aspect.

3. By this pressure the sulci on either side of the epigastric fold are effaced, and the intestines have no tendency to escape outwardly.

4. That it is possible so to regulate the pressure of the truss that minute variations may be obtained upon the area desired without exerting undue pressure at other points.

5. The motion made possible by the hinge and springs makes the pad conform to the body in all positions and under all strains, and the danger of pressure on the hernial contents, after they have slipped past, is thereby greatly lessened.

The Treatment of Acute Perforating Appendicitis with Diffuse Peritonitis.—FLODERUS (*Arch. für klin. Chir.*, 1897, Band liv. Heft 1) reports in detail a case of perforating appendicitis, with general peritonitis, in a patient twenty-five years old, which was successfully operated upon by LENNANDER one hundred hours after the inception of the disease, and about fifty hours after perforation had occurred.

The method of operating which is employed by Lennander in cases of suppurative appendicitis is an incision parallel to and a little above Poupart's ligament. Through this incision perfect drainage can be obtained in all cases, while in some it is possible to open retroperitoneally a peri-appendicular abscess. This incision also possesses the advantage of far less predisposition to hernia, as the motor nerves are not divided and the incision passes through the tendinous rather than the muscular portion of the abdomen.

In evacuating a peri-appendicular focus of suppuration great care should be taken not to infect the general peritoneal cavity. To this end the author covers the exposed intestines and the wall of the abscess with sterile compresses saturated in a physiological salt-solution. The pus should then be absorbed by small sterile compresses as soon as it shows itself in the bottom of the wound. If the pus flows in too large a quantity to be absorbed in this manner, the patient should be turned upon the right side, the median portion of the abdomen being compressed by an assistant. The pus is thus prevented from infecting the general peritoneal cavity. As soon as the pus is all out the finger is passed into the abscess-cavity and the cavity carefully cleaned with compresses.

The appendix is now sought out and removed as near to the cæcal origin as possible. In these cases of suppurative appendicitis the attempt to ligate the appendix and close the stump by sutures is unnecessary. It is better, as in the case reported, to place upon it a large hæmostat, which includes its mesentery, the distal portion of the appendix being removed. The hæmostat is removed three or four days later. There may arise later an intestinal fistula; but this is of little consequence, as it will close of itself, and may be of value in allowing the escape of gases and the consequent renewed peristalsis, as in the case reported. As soon as the appendix has been removed and all foci of suppuration, the skin is cleansed with a 1 : 1000 sublimate solution, the tampons are removed and the cavity carefully packed with iodoform-gauze. If the cavity is not too large to be easily drained, the corners of the wound may be united by a few catgut or silkworm-gut sutures.

The washing out of the general peritoneal cavity is only employed when there has been, in spite of all precautions, an escape of a large quantity of pus into the cavity or a general peritonitis is already present. If it is necessary, he employs a normal salt-solution at a temperature of about 100° F., using it until the returning water is perfectly clear. During the washing the pulse should be carefully watched, as collapse may occur due to a splanchnic reflex.

The after-treatment is of great importance, and consists in stimulation and feeding to keep up the patient's vitality during the acute stage and hasten the elimination of the poison. The method employed is digitalis for three days, followed for one week by camphor injections and the use of enemata of grape-sugar and brandy, which are the least irritating and best borne by the rectum, while they act reflexly upon the upper intestine, provoking peristaltic movements. Salt-solution transfusions are also to be employed, increasing the volume of the blood and its pressure and hindering the drying up of the tissues, which always occurs and which cannot be counteracted by the administration of fluids by the mouth.

The second indication, the removal of the poison, cannot be accomplished without the entire removal of the gangrenous appendix and the complete evacuation of the abscess-cavity. A further indication is the provoking of diuresis, which the heart-stimulants and transfusions tend to produce.

The peristalsis of the intestine must be restored as quickly as possible in order that it may empty itself of its septic contents. To this end he employs during the operation puncture of the intestines to allow the escape of the contained gases, and later the minute and frequently repeated doses of calomel, followed by a saline laxative. The same end is achieved by enemata frequently repeated and by the passage of a rubber tube up into the rectum, allowing the escape of flatus.

So long as the peristalsis is not complete no food is allowed by the mouth, the patient being sustained by the enema noted above. Since the pain following operation is due to a large extent to the meteorismus, it should be counteracted by enema and the use of the tube to draw off the gases. The author strenuously advises against the use of morphine, never employing it unless the pain is insufferable, and then only one dose of grain $\frac{1}{8}$. The morphine, by its action upon the bowel, prevents peristalsis and the discharge of the contained poisons and flatus.

The administration of morphine in the early stages of the disease only masks its symptoms and delays the diagnosis of perforation, and as each hour's delay before operation, after perforation, vitiates and lessens the patient's chance of recovery, morphine should never be employed, but the patient should be operated upon as soon as the diagnosis of perforation has been made.

Of sixty-eight cases operated upon in the clinic of Upsala there were six with diffuse and nine with fibrino-purulent peritonitis. Of the six, two only recovered, while of the nine all but one recovered, and this patient was operated upon in a moribund condition. This difference in mortality marks sharply the difference in prognosis between these two classes of critical cases.

Osteoma of the Patellar Ligament.—LEJARS (*Gaz. Hebdom. de Méd. et de Chir.*, February 21, 1897) reports an interesting case of pure osteoma situated in the patellar ligament, between the patella and tuberosity of the tibia. The tumor sprang directly from the ligament and had no connection with the patella or tibia. It was about the size of a walnut and made up of compact osseous tissue. Its removal was necessitated by its interference with the motion of the joint, which, although slight, weakened the joint.

The danger in its removal lay in the destruction of the patellar tendon; however, by a subperiosteal dissection, the tumor was removed, and after careful suturing together of the remaining portion of the tendon union was secured with no loss of function.

Traumatic Hemorrhage into the White Brain-substance Cured by Surgical Interference.—BORSUK and WIZEL (*Archiv für klin. Chir.*, 1897, Band liv. Heft 1) reports a case of hemorrhage into the white substance of the brain, followed by aphasia, hemiparesis, and Jacksonian epilepsy, which was cured by surgical interference.

After the removal of a clot from the dura and the relief of acute symptoms the patient had repeated attacks of Jacksonian epilepsy. The reopened wound showed nothing abnormal, but a long hypodermatic needle passed deeply into the brain-substance drew out a blood-stained fluid. The dura was then incised, the needle again passed, and at the point from which the blood-stained fluid was withdrawn a deep incision was made down to the white substance. Bloody fluid and blood-stained contused white matter were removed, a strip of iodoform-gauze was inserted, and the wound sutured about it. The strip of gauze was removed twelve days after the operation, and with it about a teaspoonful of blood-stained fluid. The wound then closed and the patient made a complete recovery.

This observation leads to the following conclusions:

1. Extravasations of blood of traumatic origin can be removed from the brain-substance by surgical methods, as well as contused and destroyed brain-substance, and in the same manner pathological and circumscribed portions of brain-matter.

2. It is possible that extravasations of blood other than those of traumatic origin may be removed by surgical interference.

3. The brain does not resent surgical procedures more than any other part of the body.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Foreign Body Removed from the Larynx without the Use of the Mirror.—Dr. Max Thorner, of Cincinnati, reports (*Journal of Laryngology, Rhinology, and Otology*, January, 1897) a case in which, with the aid of the Kirstein autoscope—practically a tongue depressor and nothing else—he removed from a young man a piece of chicken-bone nearly one and a half inches long, one end of which had seemed to be imbedded in the right ventricle, while the other end leaned against the ary-epiglottic ligament. This withdrawal had not even required the application of cocaine.

Suppurating Laryngeal Bursa.—An instance of this rare lesion was recently exhibited to his class by Dr. E. Fletcher Ingals, of Chicago (*Medical News*, 1897, No. 7), which occurred in a man, aged thirty years, and had been noticed only two days previously. It was about an inch in diameter, movable, and lying just beneath the skin between the notch of the thyroid cartilage and the hyoid bone. It was treated by withdrawal of the fluid and injections of a solution of carbolic acid.

Bacteriologic Investigation in Chronic Nasal Catarrh.—Dr. Eugene Larue Vansant recently read before the County Medical Society (*Philadelphia Polyclinic*, 1897, No. 11) a brief report of the results of a bacteriological investigation of the nasal mucus, with special reference to the presence of the Klebs-Löffler bacillus, in one hundred cases of chronic nasal discharge. This examination embraced one hundred and thirteen cultures taken from one hundred patients suffering with various forms of rhinitis; great care having been exercised to exclude all cases showing any of the well-known clinical signs of diphtheria. The bacilli of diphtheria were found in the discharges of twenty-six different patients, while three other patients furnished organisms closely resembling the bacilli of diphtheria.

Leaving out all consideration of the various other forms of organisms, other bacilli, cocci, diplococci, etc., it is remarkable that such a large proportion of diphtheria-bacilli should be found in these cases, taken as they come in an outdoor clinical service.

The diphtheria-bacilli were chiefly found in atrophic rhinitis, chronic purulent rhinitis, and nasal syphilis. In all the cases in which the diphtheria-bacilli were present the patients were in ill health; being listless, pale, and anæmic.

The result of future investigation with these cultures is promised in full at a later date.

The Relation of Diseases of the Nose and Throat in General Medicine.—The Lettsomian lectures now being delivered before the Medical Society of London by F. DE HAVILLAND HALL (*British Medical Journal*, 1897, No. 1884) are upon diseases of the nose and throat in relation to general medicine, and, to judge by the first one, are worthy of serious consideration not only of the general practitioner, but of the "Charlatanoide" who rushes into a specialty without any practical experience in general medicine.

After indicating the method in which many infectious diseases gain entrance by the nose and throat, attention is called to the occasional injurious effects from operative procedures upon the mucous membrane of these structures during the existence of epidemics, especially upon such people as are exposed to infection.

The conditions of the nose and throat and their involvements are then discussed in connection with diphtheria, smallpox, varicella, measles, rötheln, scarlet fever, whooping-cough, influenza, enteric fever, and erysipelas in succession.

Correction of Saddle-nose by Insertion of Plates.—At a recent meeting of the Liverpool Medical Institution (*British Medical Journal*, 1897, No. 1884) MR. THELWALL THOMAS presented a girl, fifteen years of age, upon whom he had operated seven months previously for saddle-nose deformity due to disappearance of the nasal bones in childhood from congenital syphilis. A piece of celluloid, modelled like nasal bones and possessing a well-marked keel on its concave surface, was inserted subcutaneously and pressed into position, the keel fitting between the nasal processes of the upper jaws, the lateral portions resting on these processes. The incision was made on the left side and closed by horsehair sutures. The imbedded celluloid did not appear to cause any irritation, and had of course greatly improved the personal appearance. The device was adopted in place of the many osteo-periosteal flap methods that had from time to time been described, all of which left marked cicatrices elsewhere.

[Some six months ago the compiler inserted a perforated platinum plate to correct a similar deformity in the person of a young medical gentleman. The nose and upper lip were detached from the underlying structures by the method of Rouge; and then the plate, which was somewhat guitar-shaped, was fastened by means of a vertical pin in front, which was pushed between the remnants of the nasal bones, and one horizontal pin on each side, which was inserted into holes previously drilled into the nasal process of each maxillary bone respectively.

The patient has done well, and there has been no trouble from the plate, but for a long time there was marked anæsthesia of the external portion of the nose on the maxillary lines, which has only partially subsided, while there has been a constriction of the nasal orifices requiring the almost continuous presence of metal tubes to prevent atresia.

Curiously, one of the greatest comforts to the patient is the entire subsidence of a disagreeable nasal catarrh which had bothered him for many years.]

OBSTETRICS.

UNDER THE CHARGE OF

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The Influence of Neuroses on Pregnancy and Labor.—In *La Presse Médicale*, 1897, No. 29, TARNIER discusses the influence of hysteria, epilepsy, and chorea upon pregnancy and labor. He excludes eclampsia as a neurosis because he considers it a toxæmia.

As regards hysteria, in a small number of cases pregnancy influences hysteria favorably. Very rarely, hysterical manifestations disappear during pregnancy; occasionally the attacks are less, while sometimes, on the contrary, they are much increased. It has been found by LANDOUZY and others that in the majority of cases hysteria is aggravated by pregnancy. So far as life and death are concerned, hysteria does not seriously complicate pregnancy; it exerts no unfavorable influence upon the progress of gestation, as it neither provokes abortion nor premature labor. So far as Tarnier's experience goes, it is sufficient, when necessary, to use the bromides in these cases.

As regards epilepsy, in one-fourth of the cases observed the epileptic woman is uninfluenced by pregnancy; in another fourth the epilepsy is aggravated, the attacks being more frequent and more severe, while death may occasionally ensue from a series of epileptic convulsions. In the remaining half of the cases the epilepsy seems less severe during the development of the fœtus, the attacks being less frequent and less violent. Tarnier explains this improvement by the cessation of menstruation, which in many cases seems to provoke the epileptic attack. In some patients epilepsy appears during pregnancy, ceasing after delivery, but reappearing in subsequent gestation. Epileptiform paroxysms rarely occur during labor, and are readily controlled by chloroform.

A most interesting feature regarding epilepsy and pregnancy lies in the diagnosis of epilepsy and of eclampsia. It is necessary carefully to interrogate the secretions of the patient to make a positive diagnosis. Tarnier would rely upon bromide of potassium in epileptic pregnant patients, giving the drug in large doses, one to two drachms daily.

He also reports two cases of chorea complicating pregnancy. In the first, in three successive pregnancies, chorea supervened in each, the movements localizing themselves first upon the left, and then upon the right side of the body. The second case was one in which chorea developed during pregnancy, following a profound nervous excitement. The movements at first were limited to the left hand, but afterward became general; the patient declined treatment, and passed from observation.

Unlike hysteria and epilepsy, chorea constitutes a serious complication of pregnancy; the mortality has been variously estimated from 30 to 28 per

cent.; sudden death has been reported among these patients. In fatal cases death ensues from asphyxiation, the patients becoming paralyzed and often maniacal. In 20 per cent. abortion happens, or premature labor. Many of these women were rheumatic or chlorotic before pregnancy. The prognosis is always guarded, as the chorea may become severe and fatal. As regards treatment, those remedies usually given to choreic patients are employed successfully during pregnancy.

Acetone in the Urine of Pregnant Patients as an Indication of Fœtal Death.—In the *Centralblatt für Gynäkologie*, 1897, No. 16, KNAPP reports, from the German obstetrical clinic of Prague, ten cases of fœtal death at various periods of gestation, in which, upon the day of labor, acetone was found in the urine; this substance was also present during the three days following labor. Some of these patients were syphilitic, but the influence of syphilis upon the presence of acetone is not determined. Half of the cases reported had suffered from syphilis, or were syphilitic at the time of pregnancy.

To ascertain the presence of acetone Jaksch's method was followed; this consists essentially in adding to the urine nitroprusside of sodium, and then either caustic soda or potassa to alkaline reaction. Acetic acid is then dropped into the fluid until the characteristic purple or violet color develops.

The Bacteriology of the Genital Tract in Woman.—MENGE and KRÖNIG have recently published a volume upon this subject. (Leipzig, Arthur Georgi, 1897.) A review of this volume demonstrates anew the fact that the normal puerperal uterus is free from bacteria. In 19 per cent. of puerperal women who had fever, streptococci were present. So far as the streptococcus and staphylococcus of pus and the *bacterium coli commune* are concerned, they do not exist normally in the genital tract. The exact method of infection in many cases is hard to determine.

It is possible that bacteria endogenous to the skin may cause puerperal infection, if conveyed to the genital tract. The volume is of decided interest and merits the attention of those concerned in practical asepsis.

Pruritus, Vaginismus, Ovarian Irritation and Pernicious Nausea of Pregnancy Occurring in the Same Patient.—In the *Centralblatt für Gynäkologie*, 1897, No. 12, SCHAEFFER, of Heidelberg, reports an interesting case in which a neurosis was perpetuated in spite of the occurrence of pregnancy; the patient first came under treatment for pruritus and vaginismus, and was considerably relieved by the dissection and complete removal of affected tissue. She next developed alleged pain over the left ovary, and shortly after this pregnancy occurred. She suffered during this time with excessive formation of acid in the stomach and most obstinate vomiting. She was finally carried to term, and had a spontaneous delivery; comparatively little pain was experienced during labor. After a sharp attack of diarrhœa, upon the eighth day, the pain in her left ovary disappeared. She subsequently made a partial recovery from the condition. The case is of interest as illustrating the temporary influence of pregnancy upon a neurosis, and also the

fact that neurotic patients suffer severely from gastric disturbance during pregnancy.

The Cause of Eclampsia.—A further contribution to this involved subject is made by KOLLMANN in the *Centralblatt für Gynäkologie*, 1897, No. 13. Reasoning from the fact that the blood of eclamptic patients is unusually toxic, while the urine is often less poisonous than in many other cases, he has examined the blood to ascertain the presence of a poisonous body. He believes that globulin and the substances which result from its decomposition are largely concerned in the causation of eclampsia. Deficient excretion during pregnancy results in the gradual accumulation of this substance in the blood. He considers rapid delivery unnecessary unless nature has already begun the process. He lays especial stress upon the preventive treatment of eclampsia by suitable diet and stimulation of the excretions.

Three Porro Operations.—In the *Transactions of the Obstetrical Society of London*, 1897, vol. xxxviii., SPENCER reports three Porro operations. The first was made upon a patient whose pregnancy had gone 299 days, and in whom fibroid tumors in the lower segment of the uterus rendered birth impossible. The patient was allowed to come into labor, and the head was forced strongly down into the fibroid tissue; the operation was performed under the spray. In order to check hemorrhage a pessary was placed upon the uterus and firmly pressed down; this device proved absolutely useless, and considerable hemorrhage ensued. It was difficult to extract the child on account of the firmness of the lower uterine fibroid segment. The child was asphyxiated, but revived. As the uterus did not contract, the wire loop was applied low down on the cervix, and the uterus amputated; it is stated that the patient probably lost about twelve ounces of blood. The patient made a good recovery, although her convalescence was interrupted by oozing from the stump, which required the use of sulphate of iron and of turpentine, and the application of a second wire loop. Nearly two months after operation the wound was perfectly healed. The patient nursed her child.

The second case was that of a primipara in whom an enchondroma of the pelvis rendered spontaneous birth impossible. The child survived the operation. The uterus was amputated above a wire loop. There was some oozing from the stump, and the patient died on the ninth day after delivery. On post-mortem examination interstitial nephritis and consolidation at the bases of the lungs were present.

His third case was that of a multipara who had epithelioma of the cervix; high amputation had been previously performed, and the vagina was closed by the cicatrix. Porro's operation was performed, and three years afterward the patient was free from cancer. The child survived. [It is difficult to understand the choice of Porro's operation in these cases when cœlio-hysterectomy with intrapelvic treatment of the stump and total extirpation of the uterus offers such excellent results. There can be but one reason with those familiar with hysterectomy for choosing Porro's operation, and that is the necessity for a rapid procedure. One of these operations consumed nearly an hour, and convalescence almost two months. In every particular, modern

hysterectomy before the commencement of labor, but at the period when pregnancy should normally end, is greatly to be preferred.—ED.]

The Changes in a Retained Ovum and its Appendages.—EDEN, in the *Transactions of the London Obstetrical Society*, 1897, No. 38, describes the changes which occur in a ripe and retained placenta. He also mentions those observed when the embryo is retained. His conclusions may be summarized in the statement that necrosis immediately begins, after fœtal death, in the body of the fœtus and the umbilical cord, the amnion, the extra-peritoneal chorion, and the *decidua vera*. In the placenta the maternal circulation is gradually arrested by thrombosis of the intervillous spaces. Necrosis of the various branches of the placental chorion occurs as they become shut off from the maternal blood, and fatty and calcareous degeneration is found in the necrosing tissues.

Lactosuria in Nursing-mothers.—Those who examine the urine of large numbers of pregnant and puerperal women not infrequently find traces of sugar, although no evidence of malassimilation or of diabetes can be discovered. This sugar is usually found to be lactose, and its presence is explained by PAVY (*Lancet*, April 17, 1897) as follows: he believes that in the case of nursing-mothers and cases of lactose formed in the mammary glands the lactose may be eliminated through the urine. This substance is to be distinguished from glucose by boiling the urine in sulphuric acid and applying the copper-test. It is curious to observe that it is only when a case of lactose is present that it affords a reaction in the urine. It is always abundant in the milk, but the tissues seem less capable than normally of breaking up this substance and eliminating it through the blood.

Pavy cites the case of a patient who was weaning her child because of dyspeptic trouble, accompanied by frequent micturition. The breasts were hard and lumpy, and the urine had a specific gravity of 1040, the copper-test indicating eight grains of sugar to the fluidounce. There was a family history of diabetes in the mother of the patient. The urine was of high specific gravity and lessened amount. Pavy found that the patient was drinking too little water, and that the sugar was lactose and arose from the cessation of nursing. The patient's diet was increased, and in a short time the sugar disappeared, the patient remaining in good health.

A Successful Cæsarean Section.—In the *British Medical Journal*, May 1, 1897, COUSINS reports the case of a patient at full term, deficient in mental development, with a lumbar curvature of the spine and a contracted pelvis. An unsuccessful attempt was made to extract the child by craniotomy. The situation of the placenta was diagnosticated by palpation before the uterus was opened. The womb was not lifted out of the abdomen, and sponges were placed about it to prevent the leakage of fluid. After the delivery of the child the uterus was closed with two rows of catgut stitches, and the hemorrhage arrested by pressure with sponges. The abdominal wall was united with three layers of continuous catgut and a superficial row of silk. The vagina was cleansed from clotted blood, and a tampon of iodoform-gauze inserted. The patient made an uninterrupted recovery.

GYNECOLOGY.

UNDER THE CHARGE OF

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Hemorrhage due to Syphilitic Growth in the Cervix Uteri.—WOLTER (*Münchener med. Wochenschrift*, 1896, No. 20) reports the case of a woman who was infected by her husband and bore nine dead children. Six months after her last labor she began to have metrorrhagia, which became so profuse that she was in collapse. Examination through the speculum revealed a nodule on the right side of the cervix, extending upward into the canal; it bled easily on being touched. Under antisyphilitic treatment the patient was cured in three months.

Discission of the Os Externum.—ROSNER (*Centralblatt für Gynäkologie*, 1897, No. 8) describes a plastic operation which he has recently performed, the purpose of which is to maintain the patency of the os after discission. Lateral incisions are made with a blunt-pointed bistoury. Two narrow flaps of mucous membrane are then formed from the anterior lip and are turned into the angles and sutured with catgut, the raw surfaces left after removing the flaps being also closed. A strip of gauze is inserted into the cervical canal and between the edges of the wound, and the vagina is loosely tamponed. The gauze is removed in two days, and daily douches are given. Healing takes place in eight days, and the os remains permanently open.

MARS (*Ibid.*) has simplified the operation by first lifting flaps on either side of the os, then incising laterally, and simply restoring the flaps to their former position and suturing them as before described.

Ovarian Tumor with Cancer of the Cervix.—ZEISS (*Ibid*) reports the following interesting cases:

Case I.—A woman, aged fifty-five years, who had ceased to menstruate at fifty, had had hemorrhages and watery discharges for several months. On examination carcinoma of the cervix uteri was recognized, with an ovarian cyst the size of a child's head. Vaginal hysterectomy was first performed (a single clamp being applied to the left broad ligament), when it was found to be impossible to remove the ovarian tumor *per vaginam*, as it was solid. The abdomen was opened and the neoplasm was enucleated from the right broad ligament. The patient made an afebrile recovery, but had two fistulæ in the left ureter, which necessitated the removal of the corresponding kidney a year later. She recovered and remained in perfect health. The ovarian tumor was not examined.

Case II.—The patient, aged forty-five years, had had menorrhagia for

eight months, with pelvic pains, pressure on the bowel, and rapidly declining health. Diagnosis, carcinoma of the cervix with intraligamentous ovarian cyst on the left side. Total vaginal extirpation of the uterus was performed, the organ being firmly adherent. As the operation was long and difficult and the patient was exhausted, it was decided not to remove the cyst. The recovery was uneventful.

Congenital Displacement of the Kidney in the Pelvis —MÜLLERHEIM (*Ibid.*) reports the case of a woman, aged fifty years, in whom the uterus and rectum were displaced to the right by the left kidney, which was adherent to the sacrum. The congenital nature of the anomaly was proved by the absence of any evidence of inflammation, the normal arrangement of the renal vessels, and the shortness of the ureter. The practical importance of this anomaly was demonstrated by cases in which rupture of the parturient uterus has been caused by the dystocia due to the displaced kidney. Others have been reported in which the organ was mistaken for an ovarian tumor.

This condition, which is due to faulty development of the Wolffian duct, is to be distinguished from movable kidney, in which the organ was originally in its normal position. Dystopia of the kidney is really the result of an arrested development, the organ remaining in the position which it occupied in the embryo. Accompanying congenital defects in the uterus and adnexa are quite common.

Pelvic Hæmatocele Associated with Cancer and Tuberculosis.—GARDNER (*Montreal Medical Journal*, January, 1897) reports two cases which he regards as unique in his experience. Whether the vascular changes leading to the effusion of blood were the result of the malignant disease or simply coexisted with it was not certain. In one case abdominal section was performed for adenocarcinoma of the ovary, in the other for tuberculosis of the tubes. There was no evidence of ectopic gestation in either instance.

Operative Treatment of Pruritus Vulvæ.—DIRNER (*Centralblatt für Gynäkologie*, No. 5, 1897) reports the following case: a multipara, aged sixty-five years, who had reached the climacteric twenty years before, had suffered for three years with itching and burning of the external genitals so severe that she was unable to sleep. The clitoris and labia majora were dry and cracked. There was no sugar in the urine. As medicinal treatment failed to give relief, the writer excised the affected tissue according to Sänger's method, from the mons to the fossa navicularis, including the clitoris, the wound being closed with sutures of silver wire and covered with iodoform-collodion. Primary union occurred, and the patient was discharged cured at the end of two weeks, the itching having entirely ceased.

The writer believes that pruritus vulvæ, when due neither to diabetes nor to the micro-organisms present in an irritating vaginal discharge, is really a dermatoneuritis, as described by Sänger, due to subacute inflammation of the papillæ and fibrosis of the bodies of Pacini, Krause, and Meissner, and can, as a rule, only be cured surgically.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Bacteriuria in a Child.—Under this title CLOPATT, of Helsingfors (*Revue Mensuelle des Maladies de l'Enfance*, October, 1896, p. 480), reports a case observed in a delicate girl of five years. Six months before symptoms referable to the bladder were observed she had suffered from a persistent diarrhœa lasting for two months. This was shortly succeeded by pertussis, which had reached the stage of decline when it was noticed that she had irregular evening rise of temperature with vomiting, independent of the paroxysms of her whooping-cough. Attention was now directed to the urinary organs by the fetid odor arising from the urine. Examination of the external genitals showed no disease, but urine drawn by sterilized catheter had a fetid, almost putrid odor, showed an acid reaction, and was cloudy but not opaque in appearance. After repeated filtration the liquid became clearer, but still showed a cloud when shaken. Microscopically, few leucocytes were found; but numerous freely motile rod-bacteria, which proved to be the *bacterium coli commune*.

Under daily lavage of the bladder with solutions of nitrate of silver, varying from 1 to 2000 to 1 to 1000, the urine became clear, free from odor, and sterile in about two weeks.

In this case the etiology is obscure, but it is probable that the attack of enteritis was responsible for the infection, since the bacterium coli commune existing in the liquid stools might readily reach the bladder through the urethra in a female.

It is remarkable that the colon-bacillus, which is in general pathogenic for the urinary tract, could be present in the urine in such a concentrated form without provoking cystitis. Krogius believes that the lack of conditions affecting the integrity of the mucosa of the urinary tract, such as would be caused by retention of urine or by calculus, accounts for the harmlessness of the bacterium in such cases, and that patients suffering from bacteriuria are especially liable to cystitis if exposed to unfavorable influences affecting the urinary tract.

The author advises antiseptic lavage, especially for children, since he believes that so dangerous a drug as salol could not be safely given in doses necessary to prevent the further development of the bacterium.

Presence of the Loeffler Bacillus after Ablation of the Tonsil.—LICHTWITZ (*Société de Biologie*, March 9, 1896) has made cultures of exudates formed upon the surface of the wound after ablation of the tonsil by the electrothermic loop, and in eleven out of twenty-seven cases he has found

the Klebs-Loeffler bacillus; in two cases the bacillus was present alone, and in nine was associated with the staphylococcus, streptococcus, leptothrix, or micrococci. With the sixteen other patients there were no diphtheria-germs, but divers other micro-organisms. The condition of those patients bearing the Loeffler germ differed in no respect from that of the others, and in all of the cases the wound healed equally well without the need of specific medication in the diphtheritic cases.

Putrefaction of Proteids in the Stomach.—Though much attention has been paid to the fermentative changes in the carbohydrates which are met with in the stomach, but little study has been given to the abnormal fermentative or putrefactive process which occurs at the expense of the proteids of the food. Among the products of this process hydrogen sulphide, H_2S, is not infrequently met with and is particularly disagreeable because of its offensive odor.

A case of this type, in which hydrogen sulphide putrefaction was a prominent feature, has been carefully studied by STRAUSS—*Berliner klinische Wochenschrift*, 1896, No. 18. Bacteriological examination of the stomach-contents disclosed the presence of a germ corresponding closely to the characters of bacillus coli communis—it grew characteristically on gelatin and agar, produced gas and acid when grown in sugar-broth, coagulated milk with production of acid, produced indol in sugar-free broth, and on potato formed a somewhat brownish, abundant growth. It was furthermore ascertained that bacilus coli communis regularly produces hydrogen sulphide in detectable quantity when grown in an abundant amount of ordinary agar or in pepton-water, and in pepton-broth in an atmosphere of hydrogen.

The symptoms of the case varied somewhat, and it was found that a peculiar relationship existed between the production of hydrogen sulphide and lactic acid formation. At the beginning of the illness, when the symptoms were severe, hydrogen sulphide was present in considerable quantity, but no lactic acid was detected; but later, when the symptoms had subsided somewhat, lactic acid was present, while hydrogen sulphide was not found. In seeking an explanation of this fact it was found that the addition of grape-sugar to stomach-contents undergoing the hydrogen sulphide fermentation brought this quickly to an end with a coincident abundant formation of carbon dioxide as the result of fermentation of the sugar. This suggests, of course, that in the sugar the bacillus coli finds a more easily assimilable food than in proteids, and we have thus an explanation of the well-known fact that the administration of carbohydrates tends to lessen proteid putrefaction in the stomach.

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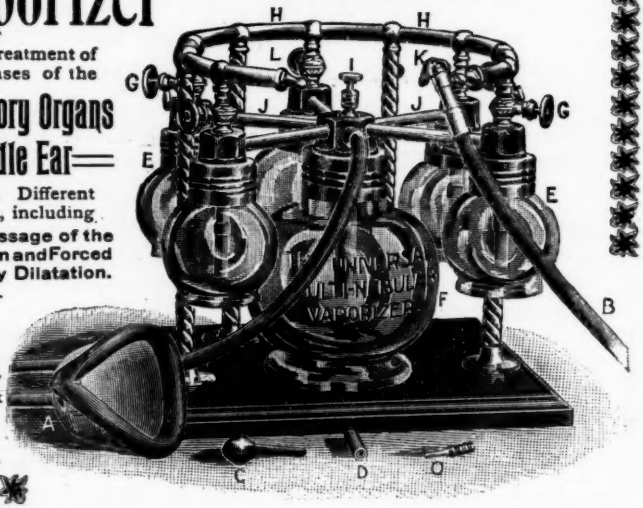

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Professor of Pharmacology and Materia Medica of the Faculty of Medicine of Paris. Director of the Laboratory of the Consulting Committee of Public Hygiene of France.

PARIS, February 12, 1897.

"The collections of **disintegrated** or **broken down vesical** or **renal calculi** which forms the subject of the following analysis and researches, were sent me by Doctor Edward Chambers Laird, resident physician **Buffalo Lithia Springs, Virginia,** U. S. A. **They were discharged by different patients after the use of the mineral water of Buffalo Lithia Spring No. 2 for a variable time.**

"I advise here from the experience of Doctor Laird the use of this mineral water, which has had with him a happy influence on the disintegration of the calculi and their elimination. It is to demonstrate this that he has requested me to make this analysis.

"The collections of the **disintegrated calculi** submitted to my examination were eight in number.

SPECIMEN OF CALCULI "A."—These **disintegrated renal calculi** are very numerous, and present themselves in the forms of grains of *various sizes (from that of the size of a pin to that of a pea)* of reddish yellow color, very hard and nucleus in the center. They are thus composed: Urate of ammonia—for the greater part; free uric acid—small quantity; carbonate of ammonia and magnesia—small quantity.

CALCULUS "B."—This **disintegrated vesical calculus** presents itself in the form of **many fragments** of a granular aspect of a greyish white color. *They are easily broken, and the contexture of the fragments show that they are porous throughout.* Chemical composition: Urate of ammonia—for the greater part; carbonate of ammonia and magnesia—in small quantity.

CALCULUS "C."—**Vesical calculus reduced to crystalline powder**, granular, of a greyish white color, rather friable. Chemical composition: Phosphate of ammonia and magnesia—for the greater part. Carbonate of lime—small **quantity.** Oxalate of lime—very small quantity.

CALCULUS "D."—**Vesical calculus thoroughly disintegrated, fragments many** and angular, granular aspect, of a rather fragile consistence of a greyish white color. Chemical composition: Bicalcic phosphate—for the greater **part** (fusible directly to the blow pipe). Oxalate of lime—small quantity. Carbonate of ammonia and magnesia—small quantity. Xanthine—very small quantity.

CALCULUS "E."—**Disintegrated renal calculi, many polyhedral fragments, rounded at the angles,** consistence hard, color yellowish red. These calculi are hard and appear formed of concentric layers. Chemical composition: Uric acid—nearly the whole part. Uric pigment—(acide rosacique.)

(SIGNED) A. GABRIEL POUCHET.

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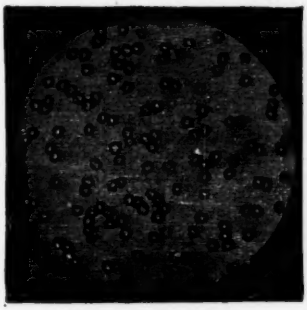

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The Extract of Cascara Sagrada, obtained from the rhamnus purshiana, is now recognized as one of our most valued laxatives, and in cases of habitual constipation has proved extremely useful, producing a mild action of the bowels, without any griping effect. The Extract of Nux Vomica also exerts a favorable action upon the gastro-intestinal tract, increasing the appetite, and, by stimulating intestinal peristalsis, relieving constipation. The general tonic effects of this drug upon the nervous system further render it of great value in cases where ferruginous preparations are indicated.

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Our list of Pills and Granules embraces those made according to the formulas of the United States Pharmacopœia; also most of those in common use among the profession.

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SPECIALLY VALUABLE IN
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AFTER THE GRIP, WHAT?

Few diseases are marked by such tedious and unsatisfactory convalescence as is the one known as epidemic influenza. After the acute symptoms have passed away, extreme weakness and prostration remain, persisting for a long time in spite of the ordinary modes of treatment. The patient is left in a condition of general debility altogether disproportionate to the apparent gravity of the affection. Vague neuralgias and mental hallucinations occur, together with an unaccustomed liability to contract other diseases with very slight exposure, or to suffer relapses of this disease. If the patient be a brainworker he finds it especially difficult to apply himself to his usual tasks. Either physical or mental exertion is followed by profound exhaustion.

Let us now look into the actual condition present, and then we can more intelligently seek an appropriate remedy—not merely a temporary palliative.

The patient has just passed through a serious and violent disease which, although of comparatively brief duration, has profoundly affected the great nerve centers, and from which they naturally can recover but slowly. Through excessive weakness of the nervous supply of the vital organs, their functions are but feebly and imperfectly carried on. How many there are who date the beginning of a permanent state of decline to their attack of La Grippe.

The ordinary tonics—iron, quinine, strychnine, &c.—seem utterly unable to cope with this condition. In fact, it is not stimulation that the patient needs, as by it he is only led to overtask his strength, and finally finds himself completely broken down. He needs a reconstruction of the worn out tissues.

The remedy which will be effective, then, must be one that will convey to the tissues the revivifying and vitalizing agent, phosphorus, in its oxidizable and assimilable form. Thus the true vitality of the nerve structure is restored and with it the healthy function is re-established. The process is not that of stimulation, or whipping up the exhausted powers, but is one of renewing the nutrition of the tissues themselves; hence it is steady and sure in its progress and permanent in its results. The patient feels that he is gradually recovering his accustomed strength of mind and body.

The one form in which the compounds of phosphorus, as they exist in normal animal cells can be conveyed to the tissues and there utilized is in the oxidizable form of the hypophosphites of lime and soda, chemically pure. It should be given early, and continued, at appropriate intervals, until the condition has been entirely overcome. Its favorable action in convalescence from acute diseases in general is especially marked in the disease under consideration. By its use many cases of chronic invalidism can be averted, and the susceptibility to intercurrent diseases corrected.

As it is essential to have the agent in an absolutely chemically pure form; McArthur's syrup should be prescribed. This is an agreeable, wholesome syrup, containing only the pure hypophosphites of lime and soda. If you are not already acquainted with it, a full sized bottle will be sent you, if you will agree to pay express charges. Address, The McArthur Hypophosphite Company, Boston, Mass.

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Peptonised beef and bread in a perfectly agreeable, soluble and absorbable form, is of incalculable value in the feeding of the sick.

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Bread and Beef contain a considerable portion of unassimilable substance—the food ballast; this, as well as the products of imperfect digestion, readily decompose into substances which, even in health, exert the most depressing influence, and in sickness become highly malefic. The greater prostration of the patient, the more useless and more dangerous is ordinary food, and the more useful and beneficial is Panopepton.

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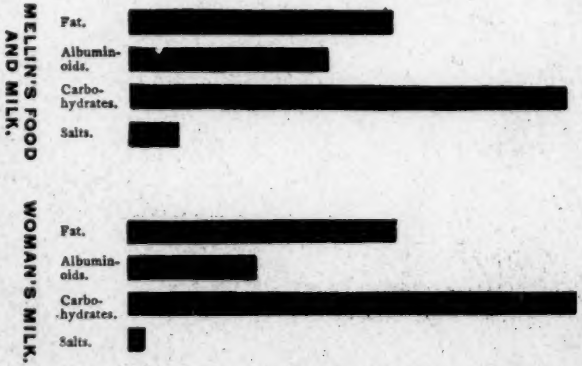

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